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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

PREFACE

Selected Water Resources Abstracts, a monthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. These documents cover water resources as treated in the life, physical, and social sciences and the related engineering and legal aspects of the characteristics, supply condition, conservation, control, use, or management of water resources. Each abstract includes a full bibliographic citation and a set of descriptors which are listed in the **Water Resources Thesaurus.** The abstract entries are classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the then Federal Council for Science and Technology.

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Comments and suggestions concerning the contents and arrangement of this bulletin are welcome.

Water Resources Scientific
Information Center
U.S. Geological Survey, MS 421
Reston, VA 22092

CONTENTS

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

VITRIFICATION OF PURE LIQUID WATER BY HIGH PRESSURE JET FREEZING,
Innsbruck Univ. (Austria). Inst. for Inorganic and Analytical Chemistry.
E. Mayer, and P. Bruggeller.
Nature (London), Vol 298, No 5876, p 715-718, August 19, 1982. 5 Fig, 30 Ref.

Descriptors: *Vitrification, *Freezing, *Ice, Cryogenics, Water properties, Physical properties, *X-ray diffraction patterns, Pure liquid water.

Pure liquid water was vitrified by projecting a thin jet of liquid water at high speed and pressure into a liquid cryomedium. Best vitrification conditions were: aperture, 10 microns; working pressure, 400 atmospheres; cryomedium, liquid propane stirred vigorously at 80K in vacuum. The product was predominantly vitreous or microcrystalline substance with a small amount of crystalline, mainly hexagonal, ice. Devitrification occurred upon warming over a 30 min period to 150K with butene-1 as the cryomedium. Devitrification started at 130K when propane was the cyromdeium. X-ray diffraction patterns of the vitrified liquid water and amorphous solid water prepared from the vapor phase were compared. However, sharp differences in patterns were difficult to discern because of interference by the cryomedia. It was not possible to observe a glass transition temperature in the vitrified water sample. (Cassar-FRC)
W83-03259

2. WATER CYCLE

2A. General

THE EXTENT AND NATURE OF RAINFALL-SOIL INTERACTION IN THE RELEASE OF SOLUBLE CHEMICALS TO RUNOFF,
Agricultural Research Service, Durant, OK. Water Quality and Watershed Research Lab.
For primary bibliographic entry see Field 5B.
W83-03170

MODELLING THE FLOOD ALLEVIATION SCHEME FOR THE USK AT BRECON,
For primary bibliographic entry see Field 8B.
W83-03247

HYDROLOGIC FLOW DETERMINATION FOR HYDROPOWER FEASIBILITY ANALYSIS,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W83-03271

RESPONSE SURFACE PARAMETER SENSITIVITY ANALYSIS METHODS FOR POSTCALIBRATION STUDIES,
Case Western Reserve Univ., Cleveland, OH. Inst. of Technology.
S. Sorooshian, and F. Arfi.
Water Resources Research, Vol 18, No 5, p 1531-1538, October, 1982. 7 Fig, 3 Tab, 22 Ref. OWRT C-90320(No 9442).

Descriptors: *Rainfall-runoff models, *Watersheds, *Calibrations, Parameters, Runoff, Rainfall, Precipitation, Physical properties, *Sensitivity analysis.

The role of parameter sensitivity analysis for postcalibration studies of conceptual rainfall-runoff models is investigated. Two sensitivity measures, namely, concentricity and interaction, which characterize the shape of the response surface in the neighborhood of the converged point were developed. When used conjunctively, the two measures provide some useful information related to the geometry of the response surface in two-parameter subspaces. The role of these measures for postestimation purposes is demonstrated in the case of a four-parameter model using synthetically generated data. (Baker-FRC)
W83-03293

REGIONAL DETECTION OF CHANGE IN WATER QUALITY VARIABLES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R. W. Koch, T. G. Sanders, and H. J. Morel-Seytoux.
Water Resources Bulletin, Vol 18, No 5, p 815-821, October, 1982. 6 Tab, 8 Ref. OWRT B-186-COLO, 14-34-0001-8069.

Descriptors: *Water quality, *Stochastic hydrology, *Variability, Statistical analysis, Hydrology, *Conductivity, *Colorado.

A method is suggested for detecting changes in the mean of hydrologic variables which have a random and stochastic nature. Adapted from the bivariate normal distribution theory, this technique forms variables (both dependent and independent) as weighted linear combinations of the mean values at a number of locations in a selected target (dependent and control (independent) area. Weighting factors are determined by a mathematical programming technique which minimizes the conditional coefficient of variation and in turn the number of observations required to detect a change of preselected magnitude in the mean of the target area. The method was applied to six Colorado river basins in two variations: (1) electrical conductivity data from three stations as the target and three stations as the control, and (2) electrical conductivity data as the target variable and annual discharge as the control. The method detected changes in the mean within a shorter time than traditional tests and was especially effective in cases of high variability and limited numbers of monitoring stations. (Cassar-FRC)
W83-03295

BASIN-SCALE EVAPOTRANSPIRATION DETERMINATION THROUGH WATERSHED AND CLIMATE ANALYSES,
Southern Piedmont Conservation Research Center, Watkinsville, GA.
For primary bibliographic entry see Field 2D.
W83-03328

OBTAINING RAINFALL INTENSITY CURVES FROM MUNICH RAINFALL RECORDS (DIE ERMITTLUNG VON REGENSPENDELINIEN AUS MUNCHNER REGENSCHREIBERAUFZEICHNUNGEN),
Technische Univ., Munich (Germany, F.R.). Lehrstuhl und Pruefamt fuer Wassergutewirtschaft und Gesundheitsingenieurwesen.
For primary bibliographic entry see Field 2B.
W83-03452

MODEL RAINFALL FOR SEWER SYSTEM DESIGN CURRENT KNOWLEDGE AND RECOMMENDATIONS (MODELLREGREN ZUR KANALNETZBEMESSUNG - KENNTNISSTAND UND EMPFEHLUNGEN),
W. Neumann, and F. Rothmeier.
Gas-und Wasserfach: Wasser/Abwasser, Vol 122, No 9, p 396-401, September, 1981. 6 Fig, 11 Ref. English abstract.

Descriptors: *Design storms, *Statistical analysis, *Statistical models, *Rainfall intensity, Storms, Model studies, Mathematical studies, Rainfall, Precipitation intensity, Sewer systems, Computer programs, Simulation, *Federal Republic of Germany, Rainstorms.

Design storms are often used in computer assisted sewer system stimulations. These design storms are derived from simple mathematical transformations of the relationship between average rainfall intensities and rainfall duraTions in response to rainfall frequencies. There are a number of advantages to using these design storms; however, it is still not certain whether or not these artificially constructed, mostly dynamic curves correspond to reality. A statistical analysis of heavy rainfall events was carried out based on long term precipitation data for Munich, Germany. An equation is presented which gives the probability of the dependence of the rainfall intensity maximum on the time occurrence, as well as the dependence of the intensity maximum on mean density. Finally, a percentile listing of 5-minute rainfall amounts in dependence on the total rainfall amount is given. From this, a statistically safe design storm car be derived. (Author's abstract)
W83-03453

IMPROVED FORMULAS FOR ESTIMATING GROUNDWATER SUPPLIES BY SHORT-TERM PRECIPITATION-MINIMUM SERIES (VERBESSERTE ANSATZA FUER DIE SCHATZUNG DER DARGEBOTE VON GRUNDWASSERMENGEN DURCH NIEDERSCHLAGS-MINIMUM-KURZREIHEN),
J. Model.
Gas- und Wasserfach: Wasser/Abwasser, Vol 122, No 8, p 340-344, 1981. 3 Fig, 3 Tab. English abstract.

Descriptors: *Groundwater recharge, *Rainfall intensity, *Mathematical studies, *Meteorological data collection, *Statistical analysis, Rainfall, Recharge, Data collections, Detmold, Federal Republic of Germany.

An evaluation of rainfall observations demonstrated that the arithmetic mean of annual rainfall data for the Administration District of Detmold (Northrhine, Westfalia) for the period 1931-1960 was unusually high. The mean was 12% higher than the mean for short-term periods within the same time range. Also, analysis of the data revealed that dry periods of several years occurred at regular intervals. Rainfall quantity is the essential factor in determining groundwater recharge; thus it is proposed to use the lowest five-year mean annual rainfall within the observation time instead of the arithmetic mean for the total observation period (of 30 years or more). Differences between the use of the lowest five year mean and the total mean are discussed. (Small-FRC)
W83-03461

A METEOROLOGICAL AND CLIMATOLOGICAL APPROACH IN DETERMINING SNOWPACK ACCUMULATION AT SNOW COURSE SITES IN A MONTANA WATERSHED,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
W. B. Tremper, P. J. Dawson, and R. H. Yaw.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-226852, Price codes: A03 in paper copy, A01 in microfiche. Montana Water Resources Research Report No 132, Montana State Univ., Bozeman, June 1983. 29 p, 3 Tab, 3 Fig, 15 Ref, 1 Append. OWRT A-132-MONT(1), 14-34-0001-1128.

Descriptors: *Precipitation (Atmospheric), *Snowfall, *Statistical models, *Snowpack, Snow survey, Water equivalent, Regression analysis, Climatic data, Meteorology, Model studies, SNOTEL, Stepwise multiple regression, Snow course, Correlation coefficients, Mountain snowpack, *Montana.

This study tests the feasibility of adequately estimating snowpack water equivalent at snow course sites in southwest Montana using meteorological parameters along with precipitation and temperature data from local climate stations in an inexpensive statistical model. The model was developed using a sample period of 200 days where weather and climate parameters were entered as independant variables in a statistical stepwise multiple regression equation with daily snowfall at snow course and SNOTEL sites as the dependant variable. The equations generated were then run with data from a 17 year period to estimate monthly snow accumulation at nearby monthly snow course sites, then compared to actual monthly totals to determine the success of the model. Using this methodology, the results show that estimates of monthly snow accumulation correlate with actual values with correlation coefficients of 0.90

and above for six of the twelve snow course sites tested (highest, 0.98) and 0.84 and above for 11 of the 12 sites. This methodology could augment snow course measurements or, in some cases, replace snow courses. This methodology can easily be used in other locations to estimate mountain snowpack in a cost effective manner as long as the area in question has representative records of daily mountain snowfall and corresponding local climate station records.
W83-03465

MATHEMATICAL MODELING IN URBAN HYDROLOGY,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
J. W. Delleur.
In: Proceedings, Applied Modeling in Catchment Hydrology, Symposium atUniversity of Mississippi, May 1981. Water Resources Research Center, 1982, p 399-419, 44 Ref., V. P. Singh, ed.

Descriptors: *Urban runoff, *Mathematical models, Urban hydrology, Model studies.

The use of the rational formula for modeling urban runoff is rapidly decreasing. Hydrograph applications have received renewed attention due to the fact that hydrograph identification and convolution can be performed very simply on small programmable calculators. Several synthetic unit hydrographs and instantaneous unit hydrographs have recently been proposed. The formulations of a design storm may be either in the form of a uniform intensity for a given duration and recurrent interval on the development of a synthetic hyetograph. Recent research shows that the design storm and antecedent soil moisture conditions have important effects on the peak flow-frequency curve. One of the simpler techniques for estimating the initial and infiltration losses is the Soil Conservation Service Curve Number Method while a more sophisticated one is used in the parametric-deterministic ADS model of the USGS. Recent improvements of some of the large scale models such as SWMM, STORM, and new versions of ILLUDAS are presented. The ADS model and SMADA (Storm Management and Design Aid) are discussed briefly. Among the methods for obtaining the least cost drainage systems are the discrete differential dynamic programming (DDDP) model and the coupling of a hydrologic model such as ILLUDAS with a dynamic programming subroutine.
W83-03486

2B. Precipitation

COMPARATIVE STUDY OF THE CAUSES AND EFFECTS OF RECENT SOUTHEASTERN DROUGHTS,
Georgia Inst. of Tech., Atlanta. School of Geophysical Sciences.
M. V. Paris, and C. G. Justus.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220343. Environmental Resources Center Report No ERC 03-83, Georgia Institute of Technology, Atlanta, April 1983. 63 p, 28 Fig, 11 Tab, 7 Ref, 1 Append. OWRT A-097-GA(1), 14-34-0001-2111.

Descriptors: *Circulation patterns, *Drought, *High pressure, Lake levels, *Precipitation, *Streamflows, Georgia, Texas, Gulf of Mexico, Southeast U.S., Moisture deficit.

The visible effects in Georgia of the 1980-81 drought, such as lower than normal lake levels, caused much public concern. This study examines the effects of the 1980-81 drought and compares them to an earlier drought in 1954-55 to determine whether the effects were more severe than precipitation amounts alone would have indicated. The location of high pressure in the Gulf of Mexico is also examined to determine whether precipitation amounts in summer months can be related to changes in normal circulation patterns. Data on precipitation for Georgia cities, regions and the entire state, as well as Texas regional precipitation, are examined. Stream flows and lake levels in Georgia are examined and compared to state-wide precipitation. Weather maps are examined for July and August in drought and non-drought years to determine circulation patterns. The 1980 drought is found to be less severe in precipitation deficit than 1954-55 and the effects on stream flows and lake levels are found to be less severe than precipitation amounts alone would have indicated, when compared to 1954-55, with the exception of one lake. A relationship is found between changes in normal circulation patterns and lower-than-normal precipitation in Georgia. Some indications are found that high pressure in the eastern Gulf of Mexico might cause higher-than-normal precipitation in Gulf Coastal Texas, while high pressure in the western Gulf might cause lower-than-normal precipitation in Gulf Coastal Texas.
W83-03297

RAINFALL CELL SIZE FROM RIT CURVE ANALYSIS,
Hawaii Univ. at Manoa, Honolulu. Water Resources Research Center.
C. M. Fullerton, S. K. Wilson, and A. Austring.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222372, Price codes: A05 in paper copy, A01 in microfiche. Technical Report No 136, UHMET 80-6, June 1980. 85 p, 7 Fig, 11 Tab, 18 Ref, 5 Append. OWRT A-059-HI(2), 14-34-0001-6012.

Descriptors: *Rainfall intensity, *Weather patterns, Hydrometeorology, Rain gages, Meteorological data, *Hawaii, *High intensity rainfall, *Rainfall intensity-time (RIT) curves, Rainfall characteristics, Meteorological parameters, Hilo.

A small and closely-spaced network of three to seven rapid response (4-s) rainfall intensity gages has been used to measure intense, short duration rain showers on the windward (eastern) coast of Hawaii Island. During a one year, intensive monitoring period, 54 events were recorded with rainfall intensities greater than 95 mm/hr on at least one gage. Four of these events had peak rainfall rates greater than 250 mm/hr. The 54 events were analyzed in an attempt to derive some properties characteristic of individual high intensity rainfall-producing 'cells'. A total of 75 cells, involving 397 separate gage measurements, were extracted from the 54 events by applying an 11-point running mean, averaging technique. The cell data were studied by sorting the rainfall intensity-time plots into curves of symmetrical shape (35.5%), and those exhibiting a positive (43%) or a negative (21.5%) skew. Normalized mean curves than were constructed for each of these three types. Ten cases appeared to involve multiple, overlapping cells, including two cases of long duration thunderstorm rainfall. These ten events were excluded from the results listed below. The average of the 65 single cell cases produced about 5 mm of rain in about 5.5 min, with an average maximum rainfall rate of about 110 mm/hr. The ground rainfall pattern moved across the network with an average speed of about 6.5 m/s. If the cell is assumed to be circular across a plane parallel with the ground, these results imply a mean cell diameter of about 2 km and an average cross-sectional cell area of about 3.2 km super 2.
W83-03339

OBTAINING RAINFALL INTENSITY CURVES FROM MUNICH RAINFALL RECORDS (DIE ERMITTLUNG VON REGENSPENDELINIEN AUS MUNCHNER REGENSCHREIBERAUFZEICHNUNGEN),
Technische Univ., Munich (Germany, F.R.). Lehrstuhl und Pruefamt fuer Wassergutewirtschaft und Gesundheitsingenieurwesen.
F. Rothmeier, and W. Neumann.
Gas- und Wasserfach: Wasser/Abwasser, Vol 122, No 2, p 64-68, February, 1981. 5 Fig, 4 Tab, 5 Ref. English abstract.

Descriptors: *Design storms, *Statistical analysis, *Rainfall intensity, *Sewer systems, *Rainfall distribution, Rain gages, Rainstorms, Precipitation intensity, Storms, Mathematical studies, Munich, *Federal Republic of Germany.

Within a special research program the German Research Society funds a study on the statistical analysis of rainfall properties to describe the design storms for sewer planning. The data base consists of raingauge records over a period of 24 years for five Munich raingauges. With an automatic digitizer, a careful evaluation of the variation in rainfall intensity was possible. Part of the research work was the revision of the relationship between average rainfall intensities and rainfall durations in response to rainfall frequencies. It can be shown that the well-known Reinhold relationship of rainfall intensity/duration/frequency can be maintained if the one-year base intensity of 15-minutes duration is modified. (Author's abstract)
W83-03452

NUMERICAL SIMULATION OF LAND-BREEZE-INDUCED SNOWBANDS ALONG THE WESTERN SHORE OF LAKE MICHIGAN,
Wisconsin Univ.-Milwaukee. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 2C.
W83-03482

2C. Snow, Ice, and Frost

CALVING SPEED OF ALASKA TIDEWATER GLACIERS, WITH APPLICATION TO COLUMBIA GLACIER,
Geological Survey, Tacoma, WA. Water Resources Div.
C. S. Brown, M. F. Meier, and A. Post.
Available from the Distribution Branch 604 S. Pickett St., Alexandria VA, Price: $5.00. Geological Survey Professional Paper 1258-C, 1982. 13 p, 6 Fig, 4 Plates, 7 Tab, 24 Ref.

Descriptors: *Glaciers, *Icebergs, *Bathymetry, Glacier mass balance, Velocity, *Alaska, *Columbia glacier, Calving glacier.

Columbia Glacier is a grounded, tidewater glacier, 1,100 square kilometers in area, which actively calves icebergs from its terminus. Calving speed, defined as the volume rate of iceberg discharge from the terminus divided by the cross-sectional area of the terminus, depends on measurable properties of the terminus and this relationship forms the terminus boundary condition for predictive models. Calving speed is the difference between glacier speed and the rate of terminus advance. The mean yearly calving speed calculated in this way for 12 glaciers in Alaska ranges from 220 to 3,700 meter per year. Yearly calving speeds estimated using balance flux and thinning flux for three additional glaciers that recently underwent rapid retreat extend the range of calving speed to 12,500 meter per year. A statistical analysis of calving speed and mean yearly values for water depth, cliff height, and glacier thickness at the terminus indicates that calving speed is fit best by a simple proportionality to average water depth at the terminus, with a constant of proportionality equal to 27 per year, producing a variance reduction fraction of 0.90. This calving relation using mean yearly values and a proposed seasonal calving relation involving runoff as a variable do not appear to be compatable. (USGS)
W83-03358

BACKWATER CURVE COMPUTATIONS UNDER ICE COVERS IN THE LA GRANDE RIVER (COURBES DE REMOUS SOUS LES COUVERTS DE GLACE DE LA GRANDE RIVIERE),
Laval Univ., Quebec. Dept. of Civil Engineering.
B. Michel, and M. Drouin.
Canadian Journal of Civil Engineering, Vol 8, No 3, p 351-363, September, 1981. 15 Fig, 10 Ref. English summary.

Descriptors: *Ice cover, *Rivers, *Mathematical studies, *Backwater curve, *Ice formation, Ice, Flow profiles, Mathematical equations, Ice thickness, Freezing, La Grande River, *Quebec, Canada.

The problem of backwater curve computations under ice covers is very complex. On top of the difficulties which are inherent to computation of backwater curves under open water flow conditions, the ice cover has to be taken into account. The ice cover's thickness and roughness are time dependent because of variable flow and weather conditions. One of the major factors is the formation of hanging ice dams, especially in most northern rivers. A complete method for the computation of backwater curves is presented based on the mechanisms of ice formation: the law of equilibrium of the frontal edge, the accumulation of ice under this edge, thermal growth, and the equilibrium of hanging dams. The method is based upon measurements taken in the La Grande River (Quebec, Canada). (Author's abstract)
W83-03395

A METEOROLOGICAL AND CLIMATOLOGICAL APPROACH IN DETERMINING SNOWPACK ACCUMULATION AT SNOW COURSE SITES IN A MONTANA WATERSHED,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2A.
W83-03465

NUMERICAL SIMULATION OF LAND-BREEZE-INDUCED SNOWBANDS ALONG THE WESTERN SHORE OF LAKE MICHIGAN,
Wisconsin Univ.-Milwaukee. Dept. of Atmospheric Sciences.
R. J. Ballentine.
Monthly Weather Review, Vol 110 , No 11, p 1544-1553, November, 1982. 15 Fig, 8 Ref.

Descriptors: *Model studies, *Atmospheris physics, *Lakes, Great Lakes, *Lake Michigan, Snow, Wind, Snowbands, Snowfall.

Case studies are presented which describe a type of lake-effect snowband which forms along the western shore of Lake Michigan when a cold anticyclone to the north sets up an easterly gradient over the lake. Numerical simulations indicate that the snowband coincides with a narrow band of upward motion which results from the convergence of easterly winds over the lake and north to northwesterly winds over land. The northerly winds are part of a land breeze circulation which forms when cold air is heated by the relatively warm lake surface. Initial data for model simulations are obtained by objective analysis of upper-air data from the eight upper-air stations closest to Lake Michigan at six levels in the lower troposhere. Model results show that a pool of cold air over the lake up to about 850 mb favors rapid growth of the planetary boundary layer over the western half of the lake, and that the latent heat release plays an important role in intensifying the land breeze circulation. (Baker-FRC)
W83-03482

2D. Evaporation and Transpiration

CONTRIBUTION TO THE MEASUREMENT OF EVAPORATION IN REMOTE STATIONS (BEITRAG ZUR VERDUNSTUNGSMESSUNG IN ABGELEGENEN STATIONEN),
Salzgitter A.G. (Germany, F.R.).
For primary bibliographic entry see Field 7B.
W83-03225

MEASUREMENT OF ACTUAL TRANSPIRATION OF NATIVE GRASS STANDS AS A COMPONENT OF NEBRASKA SANDHILLS GROUNDWATER HYDROLOGY,
Nebraska Univ., Lincoln. School of Life Sciences.
A. T. Harrison.
Nebraska Water Resources Center Completion Report, Univ. of Nebraska, Lincoln, June 1983. 45 p, 2 Fig, 3 Tab, 26 Ref. OWRT A-066-NEB(1), 14-31-0001-9129.

Descriptors: *Transpiration, *Evapotranspiration, *Consumptive use(Water), Groundwater hydrology, Hydrologic cycle, Vegetation, Grasslands, Soil moisture, Natural recharge, Plant physiology, *Nebraska, Sandhills soil types.

Objectives of this project were: (1) to quantify the role of native vegetation in site-specific evapotranspiration and to document consumptive use by native grass species on different Sandhills soil types; and (2) to identify which vegetation/soil sites may act as important hydrologic water table recharge sites based on site-specific precipitation/transpiration/percolation dynamics. Data were collected on plant physiology and water stress relationships and consumptive use at three major topographic/soil/vegetation sites in Arthur County, NE. Data on transpiration use by 5 dominant Sandhills grass species were collected in addition to gravimetric soil moisture, bulk density and texture, all at 4 topographic sites at 40 to 140 cm intervals in the soil profile. Consumptive water use during a 90-day experimental period was estimated from soil moisture changes in the 140 cm profile assuming no growing season percolation occurred below 140 cm and correcting precipitation events for litter interception. Consumptive use values for the 90 days are surprisingly similar at 230 mm, 230 mm, and 213 mm for ridge, slope and swale sites, respectively. Total soil moisture withdrawal was least at the swale site (-31 mm) due to the shallow rooted western wheatgrass which dominates the site. Soil moisture withdrawal at the slope and ridge sites, dominated by deeply rooting warm season grasses, was -47 mm and -39 mm, respectively. During 1979, season end soil moisture profile deficits ranged from approximately 100 mm in the ridge profile to 250 mm in the swale site.
W83-03312

BASIN-SCALE EVAPOTRANSPIRATION DETERMINATION THROUGH WATERSHED AND CLIMATE ANALYSES,
Southern Piedmont Conservation Research Center, Watkinsville, GA.
L. A. Harper, W. M. Snyder, and D. W. Kolberg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222174, Price codes: A04 in paper copy, A01 in microfiche. Environmental Resources Center Report No ERC 01-83, Georgia Institute of Technology, Atlanta, April 1983. 48 p, 12 Fig, 7 Tab, 11 Ref, 1 Append. OWRT A-103-GA(1), 14-34-0001-2111.

Descriptors: *Deep seepage, *Drainage, *Evaporation, Models, Precipitation, Rainfall, Runoff, *Seepage, *Water yield, Model studies, *Georgia, Watershed management, Water loss.

A model was developed to express evapotranspiration as a function of recovery of basin storage between storms. The model was designed for calibration using historical hydrologic data. Five parameters, structured to estimate evapotranspiration as a function of pan evaporation, and three parameters, expressing deep seepage, were evaluated simultaneously using non-linear least squares. A water-yield model that had been developed earlier was also calibrated against the same historical data for purposes of comparison. The same optimizing technique of non-linear least squares was used. It was found that the newly-developed basin-scale evapotranspiration model could not be satisfactorily optimized. While the model had been designed to assign structural roles to the parameters, the derived numerical values were not rational relative to these structures. The water yield model was successfully optimized on data sets from four drainage areas. Since water-yield models must inherently contain some expression of evapotranspirative losses in their structures, an attempt was made to re-interpret results of the successful optimizations. Delayed runoff could be calculated for each calendar month for up to six months following the month of rainfall input. The summation of these delayed amounts is potential runoff - that total runoff which is ascribable to rainfall of any month, regardless of the month in which the flow is delivered to the streamgage. Potential runoff subtracted from rainfall yields a difference that can be called 'not runoff'. The 'not runoff' amount is comprised to two major 'water loss' components, evapotranspiration and deep seepage. The 'not runoff' values were plotted by calendar month for three of the four basins that had continous flow. The seasonal patterns of these 'not runoff' values are so pronounced and consistent among the three drainages that the two loss components, evapotranspiration and deep seepage, can be identified.
W83-03328

FIELD STUDY OF ACTUAL EVAPOTRANSPIRATION OF A WHEAT CROP (ETUDE 'IN SITU' DE L'EVAPOTRANSPIRATION REELLE D'UNE CULTURE DE BLE),
Institut National de la Recherche Agronomique, Versailles (France). Station de Bioclimatologie.
A. Perrier, N. Katerji, G. Gosse, and B. Itier.
Agricultural Meteorology, Vol 21, No 4, p 295-311, May, 1980. 5 Fig, 2 Tab, 16 Ref. English summary.

Descriptors: *Evapotranspiration, *Crop yield, *Wheat, Water balance, Rainfall, Humidity.

The evapotranspiration of a wheat crop was studied over two consecutive years and determined by an automated energy balance system. Results were analyzed to examine the role played by meteorological factors, excluding indirect biological effects, and separately by physiological factors, on the variations in evapotranspiration. Even with the large difference in rainfall, and consequently the water balance, in the two years 1975 and 1976, it clearly appeared that the critical evapotranspiration plays a dominant role, together with the regular physiological development related to the aging of the crop, as indicated by the mean crop resistance. The good relationship between this mean crop resistance and the critical resistance defined by meteorological factors alone may be explained by the classical response of stomatal aperture to light and atmospheric humidity. Nevertheless, this relationship may suggest the definition of a specific ratio between actual evapotranspiration and the critical value of evapotranspiration, a result which can be very useful in practice. (Baker-FRC)
W83-03389

2E. Streamflow and Runoff

FIELD RATING EVALUATION OF A LARGE SUPERCRITICAL MEASUREMENT FLUME,
For primary bibliographic entry see Field 7B.
W83-03239

WINTER OF FROSTS, FLOODS AND BURSTS.
For primary bibliographic entry see Field 5F.
W83-03244

HYDROLOGIC FLOW DETERMINATION FOR HYDROPOWER FEASIBILITY ANALYSIS,
Idaho Univ., Moscow. Dept. of Civil Engineering.
J. R. Filler, and C. C. Warnick.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-219758, Price codes: A03 in paper copy, A01 in microfiche. Idaho Water and Energy Resources Research Institute Completion Report, Univ. of Idaho, Moscow, December 1982, 43 p, 7 Fig, 8 Tab, 17 Ref. OWRT A-068-IDA(2). 14-34-0001-2114.

Descriptors: *Rainfall-Runoff relationship, *Hydrologic data, *Water yield, *Duration curves, Runoff coefficient, Streamflow, Runoff feasibility, *Feasibility studies, Small watersheds, Hydroelectric power, *Idaho.

A study was made of methods for determining average annual runoff from ungaged watersheds and the use of such runoff in the estimation of flow duration curves for hydropower feasibility studies. Methods included the use of precipitation-input maps, water yield maps, and regression equations utilizing basin characteristics. The various methods were tested on gaged and ungaged watersheds in Idaho and results compared with each other, as well as the actual flow measurements. The use of watershed characteristics such as mean basin elevation, cover density, and annual precipitation were tested and compared and it was found that precipa-

tion alone provided the best and simplest approach for determining runoff. New concepts for using watershed parameters of mean basin elevation, relative topographic relief, and basin slope were proposed and briefly tested. Additional research on the inclusion of watershed characteristics and field measurement for verification is recommended.
W83-03271

GEOHYDROLOGY OF THE RIO CAMUY CAVE SYSTEM, PUERTO RICO,
Puerto Rico Univ., Mayaguez.
For primary bibliographic entry see Field 2F.
W83-03283

URBAN FLOOD DAMAGE ESTIMATING CURVES,
Georgia Inst. of Tech., Atlanta.
T. N. Debo.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 108, No HY10, p 1059-1069, October, 1982. 5 Fig, 5 Tab, 6 Ref. OWRT A-081-GA.

Descriptors: *Urban watersheds, *Flood damage, *Flood plain management, *Georgia, Land use, Planning, Flood frequency, Storm water, Flood plain zoning, Hydrologic maps.

Flood damage curves for the state of Georgia were developed using an economic computer model. Stage-frequency data, depth-damage data, physical data, and land value data were used to generate damage frequency curves from estimated damages caused by floods of 7 frequencies from 2 to 100 years. The curves apply only to the state of Georgia. They can be used to quickly estimate flood damage potential of small and large flood plain areas. The preliminary damage values can be used in planning further studies or storm water management programs, estimating damage potential with different land uses, identifying areas with the greatest damage potential and areas with no flood potential, determining the effects of land use patterns on flood damages, and estimating average annual flood damages. The curves cannot be used to obtain accurate estimates or damage estimates for specific structures. The method concerns only residential land uses, not commercial or industrial land uses. The annual flood damage estimates for five study areas were determined: Columbus, $34,500; DeKalb County, $3,144,200; Macon, $273,300; Rome, $332,600; and Waycross, $20,000. (Cassar-FRC)
W83-03294

LARGE ORGANIC DEBRIS AND ANADROMOUS FISH HABITAT IN THE COASTAL REDWOOD ENVIRONMENT: THE HYDROLOGIC SYSTEM,
California Univ., Santa Barbara. Dept. of Geological Sciences.
E. A. Keller, and A. MacDonald.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222240, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Center Completion Report, University of California, Davis, June 1983. 48 p, 13 Fig, 2 Tab, 33 Ref. OWRT-B-213-CAL(1).

Descriptors: *Detritus, *Anadromous fish, *Aquatic habitats, *Environmental effects, Fish behavior, Fish populations, Sedimentation, Coastal streams, Channels, *California, Redwood Creek watershed, Redwood National Park.

New ways to evaluate discrete hydrologic environments, such as pools, riffles and debris accumulations were developed. Experiments completed provided basic data to test a model useful for predicting hydraulic geometry of pools and riffles. These experiments will help managers develop design criteria for construction or improvement of fish habitat in channel restoration projects. Similar hydrologic experiments in Redwood National Park, have been completed to evaluate the stream power associated with organic steps and defines a sediment buffer system that modulates the movement of bedload through the fluvial system. A second line of inquiry involved debris removal experiments in Redwood National Park. Significant hydrologic and morphologic changes occurred as a result of the debris removal. Results of the debris pulling experiment suggest that the stream now is more sluggish and has less hydrologic variability than prior to the debris removal. The third line of inquiry was a comparative study between undisturbed streams flowing through old growth redwood forest with those impacted by timber harvesting. (Snyder-California)
W83-03335

THE FLOOD MITIGATION POTENTIAL OF INLAND WETLANDS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W83-03349

JOHNSTOWN-WESTERN PENNSYLVANIA STORM AND FLOODS OF JULY 19-20, 1977,
Geological Survey, Harrisburg, PA. Water Resources Div.
L. R. Hoxit, R. A. Maddox, C. F. Chappell, and S. A. Brua.
Available from Distribution Branch, 604 S. Pickett St., Alexandria, VA 22304, Price $5.00. Geological Survey Professional Paper 1211, 1982. 68 p, 34 Fig, 5 Tab, 26 Ref.

Descriptors: *Boundary processes, *Flash floods, *Flood peak, *Thunderstorms, *Dam failure, Flood damage, Flood recurrence interval, Channel improvement, Convection, High water mark, Rainfall, Weather forecasting, *Pennsylvania, Johnstown, Conemaugh River basin.

Widespread thunderstorms associated with two major squall lines, moved across Pennsylvania between the afternoon of July 19 and morning of July 20, 1977. The western part of outflow boundary produced by the second line became almost stationary in western Pennsylvania and resulted in 6 to 9 hours of nearly continuous thunderstorms. More than 6 inches of rain fell over a 400-square-mile area during this period. In the hills just north and east of Johnstown, rainfall totals were as much as 12 inches. Flash flooding was severe as the storms moved slowly southeastward across the Allegheny, Susquehanna, and Potomac River basins. Peak natural runoff rates greater than 1,000 cubic feet per second per square mile were common for streams draining up to 10 square miles. At eight gaging stations, recurrence intervals for the peak discharges were estimated to be 100 years or more. In addition to high surface runoff, some disasterous flooding also resulted from the failure of seven earthfill-gravity-type dams. At least 78 deaths were attributed to the flooding and eight persons were still listed as missing 1 year later. Total damages in the eight-county flood area were extremely high, possibly exceeding $500 million. (USGS)
W83-03357

VERIFICATION OF STEP-BACKWATER COMPUTATIONS ON EPHEMERAL STREAMS IN NORTHEASTERN WYOMING,
Geological Survey, Lawrence, KS. Water Resources Div.
S. A. Druse.
Available from Br. of Distr., USGS, 604 S. Pickett St., Alexandria, VA 22304, Price $2.75. Geological Survey Water-Supply Paper 2199, 1982. 12 p, 13 Fig, 1 Ref.

Descriptors: *Ephemeral streams, *Streamflow, *Discharge measurement, Backwater, Flow profiles, Stage-discharge relations, *Wyoming, *Step-backwater computations.

Step-backwater computations were verified by subsequent discharge measurements at three ephemeral streamflow stations in northeastern Wyoming. The standard step-backwater method for gradually varied, subcritical flow was used in computing the water-surface profiles and stage-discharge ratings. Stage-discharge rating curves and discharge measurements are illustrated for the three sites, with lines of 15% departure from the rating curves drawn to measure accuracy of the results. All discharge measurements showed departures of less than 15% at the more critical high end of the rating curves. (USGS)
W83-03366

BACKWATER CURVE COMPUTATIONS UNDER ICE COVERS IN THE LA GRANDE RIVER (COURBES DE REMOUS SOUS LES COUVERTS DE GLACE DE LA GRANDE RIVIERE),
Laval Univ., Quebec. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2C.
W83-03395

2F. Groundwater

RADIOELEMENTS, RADIOGENIC HELIUM AND AGE RELATIONSHIPS FOR GROUNDWATERS FROM THE GRANITES AT STRIPA, SWEDEN,
Royal Military Coll. of Science, Shrivenham (England).
J. N. Andrews, I. S. Giles, R. L. F. Kay, D. J. Lee, and J. K. Osmond.
Geochimica et Cosmochimica Acta, Vol 46, No 9, p 1533-1543, September, 1982. 7 Fig, 3 Tab, 28 Ref.

Descriptors: *Geochemistry, *Granites, *Radioisotopes, *Uranium radioisotopes, *Groundwater dating, Hydrologic models, Radium radioisotopes, Helium, Radon, Groundwater, Geologic fractures, *Sweden.

The geochemistry and isotopic relationships of uranium (U), radium (Ra), radon (Rn), and radiogenic helium (He) in groundwaters from the Stripa granite, Sweden, were examined in connection with groundwater evolution and aging. The solution of radiogenic He and these radioelements in fractured rocks is dependent upon their distribution in the rock matrix and the extent of the rock-water interface. The U234/U238 activity ratio and the dissolved U, Rn and He contents of such groundwaters are affected by changes in the flow regime with time. The U234/U238 activity ratio is strongly influenced by the U distribution within fractures, the extent of the rock-water interface, and the concentration of U238 in solution. These effects may be quantitatively evaluated by models for a fractured crystalline rock in which the U is localized in microfractures and grain boundaries. Groundwaters from depths up to 880 m in the Stripa granite have variable dissolved U contents and U234/U238 activity ratios. The geochemistry of U is determined primarily by variations in flow path rather than by groundwater age. Dissolved radiogenic He in groundwaters increases with depth and is dependent upon the U content and fracture porosity of the granite. The content of radiogenic He increases with groundwater residence time. However, the movement of radiogenic He by diffusion and transport processes makes it impossible to determine the actual groundwater age. (Geiger-FRC)
W83-03208

EXTREME FRACTIONATION OF U234/U238 AND TH230/U234 IN SPRING WATERS, SEDIMENTS, AND FOSSILS AT THE POMME DE TERRE VALLEY, SOUTHWESTERN MISSOURI,
Geological Survey, Denver, CO.
For primary bibliographic entry see Field 2K.
W83-03209

INVESTIGATIVE PROGRAMS FOR DESIGNING AND MODELING MINE WATER CONTROL SYSTEMS,
International Engineering Co., Inc., San Francisco, CA.
For primary bibliographic entry see Field 4B.
W83-03265

GEOHYDROLOGY OF THE RIO CAMUY CAVE SYSTEM, PUERTO RICO,

Puerto Rico Univ., Mayaguez.
A. Torres-Gonzalez, E. Aguilar, and G. Pannela.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-219972, Price codes: A04 in paper copy, A01 in microfiche. Puerto Rico Water Resources Research Institute Completion Report, Mayaguez, May 1983. 57 p, 20 Fig, 3 Tab, 20 Ref. OWRT A-053-PR(1), 14-34-0001-8041.

Descriptors: *Hydrogeology, *Underground streams, *Caves, *Puerto Rico, *Underground rivers, Rio Camuy River.

The Rio Camuy, a major river on the northwest coast of Puerto Rico, flows underground for straight-line distance of about 6 kilometers. This underground journey through part of the 15 kilometer long Rio Camuy Caves System is the largest of the island and perhaps the most spectacular in the western hemisphere. The rocks making up the lithologic framework of the cave system all belongs to the Lares Limestone. A relation exists between the system development and fractures, but lineating alone cannot justify the formation of a complex and gigantic cave system as that of the Rio Camuy. Sea Level fluctuations have played th most determinant role in the karstification of the Lares Limestone. Streamflow and rainfall records indicated that 1) the travel time of Rio Camuy through the underground passages fluctuated from 2.5 to 9 hours and 2) the highest recorded flow passing through Blue Hole was about 3,000 cfs. Its maximum intake capacity is estimated in about 4,000 cfs. The towns of Hatillo and Camuy are protected from catastrophic floodings thanks to this natural flood control structure or even more, during hurricane flows. The discovery of a new passage of the cave in February 1980, has demonstrated the existance of a second resurgence through which Rio Camuy overflows to the surface. Dye tests, hydrochemical analyses and numerous cave systems, conducted during the course of this investigation, have proven the existence of hypothetical passage connections.
W83-03283

THE GROUNDWATER BUDGET OF LAKE WINGRA, DANE COUNTY, WISCONSIN,
Wisconsin Univ.-Madison. Dept. of Geology and Geophysics.
D. F. Pennequin, and M. P. Anderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220525, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Center Technical Report WIS WRC 83-01, Univ. of Wisconsin, Madison, 1983. 43 p, 18 Fig, 5 Tab, 23 Ref. OWRT A-092-WIS(1), 14-34-0001-1153.

Descriptors: *Aquifers, Field studies, Groundwater, *Lakes, *Model studies, *Piezometers, Computer models, Darcy's law, *Groundwater budget, *Groundwater movement, Lake beds, Lake shores, Seepage, *Wisconsin, Lake Wingra.

The groundwater circulation pattern and a groundwater budget were established for the late spring and summer of 1981 for Lake Wingra, Madison, Wisconsin. Minipiezometers and conventional piezometers emplaced in the lakebed and the shore sediments showed that groundwater generally flows into the lake from the west, north, and south shores and leaves the lake through the east shore. Daily and weekly water level measurements showed that the overall configuration of the groundwater system around and below the lake is stable. However, the hydrogeologic system around Lake Wingra is permanently in a transient state because the groundwater levels fluctuate continuously. The groundwater budgets for the lake for August 1981 and for the period June to August 1981 were established using mini-piezometers, in-lake and onshore piezometers, and a standard Darcy's law approach. A finite-difference cross-sectional model was used to estimate hydrogeologic and geologic parameters needed to calculate the groundwater budget for the lake. Groundwater seeps into the lake at an average rate of about 0.3 ft sub 3/sec, and out of the lake at rates of 0.08 to 0.09 ft super 3/sec. These in- and out-seepage rates are significantly lower than those previously estimated, but are believed to be more accurate because of the more numerous field data available for use in this study.
W83-03305

RESULTS OF HYDROLOGIC TESTS AND WATER-CHEMISTRY ANALYSES, WELLS H-5A, H-5B, AND H-5C, AT THE PROPOSED WASTE ISOLATION PILOT PLANT SITE, SOUTHEASTERN NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 2K.
W83-03360

RESULTS OF HYDROLOGIC TESTS AND WATER-CHEMISTRY ANALYSES, WELLS H-6A, H-6B, AND H-6C, AT THE PROPOSED WASTE ISOLATION PILOT PLANT SITE, SOUTHEASTERN NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 2K.
W83-03361

ENVIRONMENTAL ISOTOPIC AND HYDROGEOCHEMICAL INVESTIGATION OF RECHARGE AND SUBSURFACE FLOW IN EAGLE VALLEY, NEVADA,
Nevada Univ. System, Reno. Desert Research Inst.
J. E. Szecsody, R. L. Jacobson, and M. E. Campana.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-224402, Price codes: A07 in paper A01 in microfiche. Publication No 42037, April 1983. 120 p, 39 Fig, 7 Tab, 85 Ref, 3 Append. OWRT B-123-NEV(1), 14-34-0001-1244.

Descriptors: *Stable isotopes, *Tritium, *Carbon radioisotopes, *Groundwater recharge, Subsurface flow, Hydrogeochemistry, Groundwater age dating, Eagle Valley, *Nevada, Lysimeters, Snow sampling, Water analysis, Water chemistry, Isotope analysis.

Snow sampling in the main recharge area of Eagle Valley indicates nonequilibrium fractionation of stable isotopes according to the relationship: the variation of D/H = 6.0(the variation of super 18 0/super 16 0)-14. There is a significant correlation between isotopic depletion and elevation, as indicated by: the variation of D/H = -9.9 degrees / oo/1000 ft and the variation of 18/16 = -1.48 degrees /oo/1000 ft. Electrical conductivity and chloride enrichment from snow to lysimeter water produces an estimate of 3900 acre-ft/year of potential recharge to Eagle Valley from the Carson Range. Monitoring of lysimeters throughout the winter shows that the ground is not necessarily frozen under snow and that infiltration and recharge can occur during the winter. Contour maps of sulfate, chloride, sodium, and deuterium concentrations in the valley aquifer suggest thermal/non-thermal water mixing. Aquifer stable isotope values and recharge area values indicate recharge to the aquifer via stream channel infiltration and deep percolation-fracture flow. Tritium and carbon-14 dating of nonthermal water in the aquifer indicates recharge from the Carson Range and in the vicinity the Carson River, with the oldest non-thermal water in the basin center. Carson Hot Springs is about 12,500 years old and is isotopically depleted, whereas Prison Hot Springs contains recent water and is not depleted.
W83-03380

'GEOTHERMAL MINERAL EQUILIBRIA.' REPLY TO A COMMENT BY M. A. GRANT,
Department of Scientific and Industrial Research, Petone (New Zealand). Chemistry Div.
For primary bibliographic entry see Field 2K.
W83-03416

EFFECTS OF GROUNDWATER PUMPAGE ON SURFACE AND GROUNDWATER FLOWS ON ADJOINING BASINS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4B.
W83-03431

ON THE LACK OF A UNIQUE RELATION BETWEEN C02 PARTIAL PRESSURE AND TEMPERATURE IN GEOTHERMAL SYSTEM. COMMENT ON 'GEOTHERMAL MINERAL EQUILIBRIA' BY W. F. GIGGENBACH,
Department of Scientific and Industrial Research, Wellington (New Zealand). Applied Mathematics Div.
For primary bibliographic entry see Field 2K.
W83-03434

MODIFIED MONTHLY MINIMUM METHOD FOR RAPID CALCULATION OF GROUNDWATER RECHARGE FROM RECEIVING STREAM RUNOFF (DAS MODIFIZIERTE VERFAHREN MOMNO (R12) ZUR RASCHEN ERMITTLUNG DER GRUNDWASSERNEUBILDUNGSRATE AUS DEM VORFLUTERABFLUSS),
Geologisches Landesamt Baden-Wuerttemberg, Freiburg im Breisgau (Germany, F.R.).
E. Villinger.
Gas- und Wasserfach: Wasser/Abwasser, Vol 122, No 8, p 335-339, 1981. 3 Fig, 1 Tab, 8 Ref. English abstract.

Descriptors: *Groundwater recharge, *Surface runoff, *Mathematical studies, *Graphical methods, *Hydrographs, Recharge, Hydrography, Groundwater, Runoff, Geohydrology, Catchment areas.

The rate of groundwater recharge within a catchment area can be determined from the runoff in the receiving stream. For this purpose the runoff must be divided into a surface water component A(o) and a groundwater component A(u); the latter is assumed to be equal to the amount of groundwater recharge. The determination of A(u) is done by graphical separation on a hydrograph constructed from the average low water discharge for each of 12 months. This new method is very simple and gives quick, reliable results. (Author's abstract)
W83-03447

RELIABILITY AND VERIFICATION OF GEOHYDROLOGIC MODELS (ZUVERLASSIGKEIT UND VERIFIKATION VON GEOHYDROLOGISCHEN MODELLEN),
Rijksinstituut voor Drinkwatervoorziening, Leidschendam (Netherlands).
A. Obdam.
Gas- und Wasserfach Wasser/Abwasser, Vol 122, No 5, May, 1981. 4 Fig, 4 Tab, 4 Ref. English abstract.

Descriptors: *Model studies, *Mathematical models, *Geohydrology, *Interfaces, Analysis of variance, Statistical analysis, Groundwater, Groundwater flow, Saline water intrusion, Saline freshwater interfaces.

The reliability of a geohydrological model was determined by examining various possible sources of error including the scheme of the model, the system parameters, the boundary conditions, and the initial conditions. Verification of the model scheme is a way to determine the model's reliability. Then, variances in system parameters, boundary conditions, and initial conditions should be determined. Finally, variances in model results can be calculated. This verification procedure is illustrated using a simple example, namely the calculation of a freshwater-brackish interface in groundwater. (Author's abstract)
W83-03448

IMPROVED FORMULAS FOR ESTIMATING GROUNDWATER SUPPLIES BY SHORT-TERM PRECIPITATION-MINIMUM SERIES (VERBESSERTE ANSATZA FUER DIE SCHATZUNG DER DARGEBOTE VON GRUNDWASSERMENGEN DURCH NIEDERSCHLAGS-MINIMUM-KURZREIHEN),
For primary bibliographic entry see Field 2A.
W83-03461

Group 2F—Groundwater

GROUND WATER QUANTITY AND QUALITY IN FRACTURE ZONES IN ABBEVILLE COUNTY, SOUTH CAROLINA,
Clemson Univ., SC. Dept. of Chemistry and Geology.
For primary bibliographic entry see Field 3B.
W83-03466

TRANS-BOUNDARY GEOTHERMAL RESOURCES OF TEXAS AND MEXICO,
Texas Univ. at Austin. Bureau of Economic Geology.
C. D. Henry, and R. A. Morton.
Natural Resources Journal, Vol 22, No 4, p 973-989, October, 1982. 3 Fig, 2 Tab, 16 Ref.

Descriptors: *Geothermal resources, *Resources development, *Texas, *Mexico, *Water temperature, Natural resources, Temperature, Geothermal power, Electric power production, Wells, Hot springs, Warm springs, Flow rate, Chihuahua, Coahuila, Tamaulipas, Nuevo Leon.

Potential geothermal resources in the Texas-Mexico border region include the following: convective geothermal systems in Trans-Pecos Texas, Chihuahua, and Coahuila; and geopressured geothermal systems in South Texas, Tamaulipas, and Nuevo Leon. The convective geothermal systems are characterized by hot springs and shallow hot wells located along normal faults. The maximum temperature measured is 90C, while the maximum temperature estimated from chemical geothermometers is 160C. For the most part, temperatures are lower, and none of the water is hot enough to generate electricity. Most are too far from population centers to be used for heating or industrial purposes with the exception of the Hueco Tanks near El Paso and Juarez. Data on flow rate, depth, measured/calculated temperature, total dissolved solids, and chemical type are presented for hot springs and wells in the Rio Grande Area. Geopressured geothermal well test data are also presented. One well in Brazoria County, Texas, tested at rates up to 3500 cu m/day with only a minor pressure decline. (Small-FRC)
W83-03499

2G. Water In Soils

FIELD EVALUATION OF A WATER MANAGEMENT SIMULATION MODEL,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W83-03238

ON THE ESIMATION OF THE ERROR OF SOIL MOISTURE MEASUREMENT BY MEANS OF A NEUTRON SCATTERING PROBE (ZUR ABSCHATZUNG DES FEHLERS DER BODENFEUCHTE-MESSUNG MIT EINER NEUTRONENSONDE),
Freiburg Univ. (Germany, F.R.).
For primary bibliographic entry see Field 7B.
W83-03242

ON-SITE SEWAGE DISPOSAL: SITE SUITABILITY, SYSTEM SELECTION AND SOIL ABSORPTION AREA SIZING,
Pennsylvania State Univ., University Park. Coll. of Agriculture.
For primary bibliographic entry see Field 5D.
W83-03268

WATER QUALITY TRANSMISSION AND RUNOFF FROM EASILY CRUSTED ERODABLE SOILS AND MINE SPOILS. EFFECTS OF IN-SITU CROSSLINKABLE OIL TREATMENTS,
North Dakota State Univ., Fargo. Dept. of Chemistry.
For primary bibliographic entry see Field 4D.
W83-03269

EFFICIENT USE OF WATER FOR IRRIGATION IN THE UPPER MIDWEST,
Illinois Univ. at Urbana-Champaign. Water Resources Center.
For primary bibliographic entry see Field 6D.
W83-03282

A COMPUTER MODEL FOR PREDICTING THE IMPACT OF IRRIGATING WITH SALINE WATER ON SOILS AND RUNOFF WATER IN MISSOURI,
Missouri Univ.-Columbia. Dept. of Agronomy.
For primary bibliographic entry see Field 3C.
W83-03284

SURFACE IRRIGATION AS AFFECTED BY ASH FROM MOUNT ST. HELENS,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W83-03285

MEASUREMENT OF ACTUAL TRANSPIRATION OF NATIVE GRASS STANDS AS A COMPONENT OF NEBRASKA SANDHILLS GROUNDWATER HYDROLOGY,
Nebraska Univ., Lincoln. School of Life Sciences.
For primary bibliographic entry see Field 2D.
W83-03312

UNDISTURBED CORE METHOD FOR DETERMINING AND EVALUATING THE HYDRAULIC CONDUCTIVITY OF UNSATURATED SEDIMENTS,
Illinois State Geological Survey Div., Champaign.
A. Elzeftawy, and K. Cartwright.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-221721, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Center Research Report No 177, Univ. of Illinois, Urbana, April 1983. 53 p, 14 Fig, 6 Tab, 25 Ref, 2 Append. OWRT A-097-ILL(5), 14-34-0001-0115.

Descriptors: *Unsaturated hydraulic conductivity, Soil water, Matching factor, *Permeability, Groundwater, *Soil water potential, *Water retention, *Illinois, Waste disposal sites.

A new method was developed to predict the transport of moisture and contaminants in soils. Study results indicate that this method could help simplify evaluation of municipal and industrial waste disposal sites for their potential environmental impact. Saturated and unsaturated hydraulic conductivities of several Illinois soils, calculated on the basis of pore size distribution, were shown to predict reliably the experimentally measured laboratory values. For coarse-textured soil materials and materials with a relatively narrow range of pore size, only one matching factor was required to calculate the hydraulic conductivity-water content relation accurately enough for many purposes; however, for fine-textured soil materials iwth a wide range of pore size distribution, two or more matching factors at a water content in the 0.3 to 0.4 bar range may be needed to obtain a useful evaluation for the unsaturated hydraulic conductivity.
W83-03319

OBTAINING SOIL PHYSICAL FIELD DATA FOR SIMULATING SOIL MOISTURE REGIMES AND ASSOCIATED POTATO GROWTH,
Stichting voor Bodemkartering, Wageningen (Netherlands).Dept. of Applied Soil Physics.
C. Belmans, L. W. Dekker, and J. Bouma.
Agricultural Water Management, Vol 5, No 4, p 319-333, December, 1982. 7 Fig, 3 Tab, 38 Ref.

Descriptors: *Soil moisture, *Crop yield, *Soil properties, Moisture content, Permeability coefficient, Permeability, Soil permeability, Crop growth, *Potatoes, Sand, Loam, *The Netherlands, Model studies, Moisture profiles.

Monitoring was undertaken of soil moisture regimes under potatoes during two growing seasons in a sandy loam and a silty clay loam soil in the Netherlands. Validation of calculated moisture contents with the simulation model SWATRE was obtained from measured moisture contents. The study collected the following data for use in the model: hydraulic conductivity, moisture retention, rooting depth and soil cover data. Measured groundwater levels formed the lower boundary condition, and precipitation and potential evapotranspiration the upper boundary condition of the model flow system. Calculated moisture contents agreed well with the measured values, but only when in situ moisture retention curves were used in the study and when the effects of cracking in the silty clay loam soil were expressed by modifying the hydraulic conductivity function. The moisture supply capacity of the sandy loam soil was highest, particularly in the first growing season, and this was interpreted as a major reason for the corresponding higher yields. Simulation can be used for predicting the soil moisture supply capacity in the context of land evaluation when soil cover and rooting depth are standardized, for example by simulating growth of a grass crop. (Baker-FRC)
W83-03390

A METHOD FOR IMPROVING CHEAPLY THE TIME RESPONSE OF PRESSURE-TRANSDUCER TENSIOMETER SYSTEMS,
Rothamsted Experimental Station, Harpenden (England).Dept. of Physics.
For primary bibliographic entry see Field 7B.
W83-03409

2H. Lakes

WATER STORAGE CAPACITY OF NATURAL WETLAND DEPRESSIONS IN THE DEVILS LAKE BASIN OF NORTH DAKOTA,
Fish and Wildlife Service, Bismarck, ND.
A. P. Ludden, D. L. Frink, and D. H. Johnson.
Journal of Soil and Water Conservation, Vol 38, No 1, p 45-48, January-February, 1983. 3 Fig, 4 Tab, 12 Ref.

Descriptors: *Water storage, *Surface runoff, *Wetlands, Rainfall, Runoff, Devils Lake Basin, Water supply development, *North Dakota.

The Devils Lake Basin study was undertaken in 1976 in response to the conflict between wildlife and agricultural interests and to better understand the basin's hydrology. The primary goal of the study was to develop a plan for long-term management of water and related land resources in the basin. The scope of the study was limited to estimating the storage capacities of the depressions other than lakes in the Basin. Shallow natural depressions account for maximum water surface area of 164,000 hectares of drained and undrained wetlands. Their maximum storage capacity is 811,000 cubic dekameters. The wetland depressions retain about 143,000 cubic dekameters or 72% of the total runoff for a 2-year runoff and about 537,000 cubic dekameters of 41% of the runoff for a 100-year runoff. The average depth of the depressions during normal runoff years is relatively shallow. A 2-year runoff will result in an average depth of 20 centimeters. A 100-year runoff will result in an average depth of 47 centimeters. At maximum capacity the average depth of the natural depression was estimated at 53 centimeters. (Baker-FRC)
W83-03160

EVALUATING THE RELEASE OF SOLUBLE COMPONENTS FROM SEDIMENT,
Technion - Israel Inst. of Tech., Haifa.
For primary bibliographic entry see Field 5B.
W83-03168

BUFFER CAPACITIES OF FRESH WATER LAKES SENSITIVE TO ACID RAIN DEPOSITION,
Rutgers - The State Univ., New Brunswick, NJ. Center for Coastal and Environmental Studies.
S. D. Faust, and A. McIntosh.
Journal of Environmental Science and Health, Part A, Vol 18, No 1, p 155-161, 1983. 1 Fig, 1 Tab, 3 Ref.

Descriptors: *Acid rain, *Buffer capacity, *Alkalinity, Acidity, Bases, Carbonates, Bicarbonates, Hydrogen ion concentration, Chemical reactions, Lakes, Streams.

The Van Slyke definition of buffer capacity, the increment of a strong base or strong acid that causes an incremental change in the pH value of water, is better than total alkalinity for defining a water's resistance to acid rain. This Van Slyke value, designated by beta, shows a peak at pH 6.3 for the bicarbonate-carbonate pair, indicating that the effect of acid rain on the pH and alkalinity of natural waters is not deleterious until this peak is traversed. A beta value of zero indicates a dead water with no capacity to neutralize acid. The beta values, pH and total alkalinity of lakes, reservoirs, and streams in New Jersey are given. Data clearly show that pH and alkalinity alone cannot determine buffer capacity. For example, Fairview Lake (pH of 5.5 and alkalinity of 10.2 mg per liter) has a beta value 11 times that of Clyde Potts Reservoir (pH of 7.3, alkalinity of 8.1 mg per liter). (Cassar-FRC)
W83-03171

THE PHYTOPLANKTON ECOLOGY OF DEVILS LAKE,
North Dakota Univ., Grand Forks. Dept. of Biology.
C. M. Conway.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-212282, Price codes: A08 in paper copy, A01 in microfiche. Water Resources Research Institute Completion Report, North Dakota State University, Fargo, January 1983. 163 p, 31 Fig, 27 Tab, 120 Ref. OWRT A-053-NDAK(1), 14-34-0001-7071.

Descriptors: *Phytoplankton, Water quality, *Drainage, Nutrients, Migratory birds, Anions, Cations, Trace elements, Biomass, *North Dakota, Devils Lake, Ecosystems.

Devils Lake is an inland aquatic ecosystem of glacial origin and represents the largest natural lake in North Dakota. The Devils Lake basin is a self-contained drainage system of 3604 mi super 2(9334.4 km super 2), which consists of nine small watersheds. This lake lies in the central flyway for migratory waterfowl and approximately 50% of the waterfowl production in North America occurs in the region. Recorded lake levels for the past century have fluctuated drastically with changing climatic conditions. This has resulted in extreme changes in salinity and water quality. In this study the following items were determined: (1) ambient concentrations of major anions, cation, and selected trace elements, (2) the composition and biomass of phytoplankton, (3) the algal growth potential and limiting nutrients, and (4) statistically significant interactions of nutrients and algal biomass, seasonally and spatially in the Devils Lake system: Big Coulee, Main Lake and East Bay.
W83-03180

IN SITU NITROGEN (C2H2) FIXATION IN LAKES OF SOUTHERM VICTORIA LAND, ANTARCTICA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
F. C. T. Allnutt, B. C. Parker, K. G. Seaburg, and G. M. Simmons, Jr.
Hydrobiological Bulletin, Vol 15, No 3, p 99-109, December, 1981. 2 Fig, 5 Tab, 24 Ref.

Descriptors: *Nitrogen fixation, *Algae, *Acetylene reduction, *Antarctica, Lakes, Cold regions, Cyanophyta, Bacteria, Littoral zone, Benthic environment, Ice cover, Iced lakes.

Nitrogen fixation as measured by acetylene reduction occurred in several habitats in and near several Antarctic lakes located in southern Victoria Land. Samples of algal mat and sediments were collected during the summers of 1977-78 and 1978-79 from Lakes Bonney, Brownworth, Chad, Fryxell, Miers, Vanda, and Hoare. Nitrogen fixation rates were highest (up to 3.359 n mol acetylene per day per mg C) in bluegreen algal mats located in high light intensity habitats such as ice-free moats and peripheral and outflow areas. The benthic mats under reduced light, such as under 5-6 m of permanent lake ice, showed no detectable nitrogenase activity. Nitrogen fixation potential was greatest in water with lower ammonium ion levels and in the presence of heterocystous bluegreen algae, Nostoc commune, Tolypothrix, and Calothrix. Since organic additions to the culture did not stimulate nitrogen fixation, the role of heterotrophic bacteria was insignificant. However, anaerobic nitrogen fixation for select oxygen-free habitats could not be completely ruled out. (Cassar-FRC)
W83-03203

MEROMIXIS IN AN EQUATORIAL AFRICAN SODA LAKE,
Duke Univ., Durham, NC. Dept. of Zoology.
S. MacIntyre, and J. M. Melack.
Limnology and Oceanography, Vol 24, No 4, p 595-609, July, 1982. 8 Fig, 6 Tab, 46 Ref.

Descriptors: *Lake morphometry, *Meromixis, Hydrobiology, *Chemical stratification, *Seasonal variation, *Chemocline, Rainfall, *Stability analysis, Lakes, Lake morphology, Limnology, Mixing, Stratification, Lake basins, Thermal stratification, Diurnal distribution, Mixolimnion, *Kenya, Lake Sonachi.

Lake Sonachi, a small volcanic crater lake in central Kenya, was chemically stratified on all of 17 sampling dates spanning 8 years. Values of chemical stability were low. Maintenance of meromixis was attributed to basin morphometry, the diurnal periodicity of the winds and of thermal stratification, biological decomposition and seasonal and annual changes in rainfall. Wind speeds were maximal when the lake was thermally stratified. Higher values of hydrogen sulfide, lower pH, soluble reactive phosphate, and ammonia in deeper waters suggest that biological processes contribute to meromixis. During 1971-1976, rainfall totaled less than average and chemical stability declined to 700 ergs/sq cm. When the lake was sampled after 2 years of above average and 1 year of average rainfall, stability had increased to 200,300 ergs/sq cm, and the conductivity and the volume of water below the chemocline had increased substantially. It was suggested that chemical stratification is enhanced by groundwaters that dissolve evaporites in the lake sediments and seep into the lake. (Geiger-FRC)
W83-03254

THE UPTAKE OF DISSOLVED NITROGENOUS NUTRIENTS BY LAKE KINNERET (ISRAEL) MICROPLANKTON,
Harvard Univ., Cambridge, MA. Museum of Comparative Zoology.
J. J. McCarthy, D. Wynne, and T. Berman.
Limnology and Oceanography, Vol 24, No 4, p 673-680, July, 1982. 5 Fig, 5 Tab, 34 Ref.

Descriptors: *Nutrients, *Plankton, *Lakes, *Nitrogen, *Nitrates, *Ammonia, *Ureas, Cycling nutrients, Phytoplankton, Nitrogen coompounds, Seasonal variation, Microorganisms, *Israel, Lake Kinneret.

The uptake rates of dissolved nitrogenous nutrients by the microplankton of Lake Kinneret, a warm monomictic lake in northern Israel, were examined over a two-year period. Nitrate was generally the most abundant nutrient, followed closely by ammonia and urea nitrogen in much lower concentrations. In the spring when Peridinium cinctum was dominant, nitrate dominated the total nitrogenous nutrients pool, but at all times phytoplankton showed preferential uptake of ammonia. Peridinium bloom periods were characterized by the highest specific uptake and transport rates for ammonia. Throughout the study period, turnover times ranged from 21 to over 7,000 hr for nitrate, from 1 to 630 hr for ammonia, and from 5 to over 560 hr for urea nitrogen. Midday uptake rates for nitrate, ammonia, and urea nitrogen were all higher under natural light than in darkness. Patterns of microplankton preferential usage for the dissolved nitrogenous nutrients of lake Kinneret were similar to those reported for Chesapeake Bay plankton. (Geiger-FRC)
W83-03260

DIEL CHANGES IN NUMBERS AND ACTIVITIES OF BACTERIOPLANKTON IN A RESERVOIR IN RELATION TO ALGAL PRODUCTION,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
V. Straskrabova, and J. Fuksa.
Limnology and Oceanography, Vol 24, No 4, p 660-672, July, 1982. 5 Fig, 5 Tab, 22 Ref.

Descriptors: *Growth kinetics, *Reservoirs, *Diurnal distribution, *Seasonal variation, *Aquatic bacteria, Surface water, Seasonal distribution, Bacterial analysis, Algal growth, Phytoplankton, Plankton, *Czechoslovakia, Slapy Reservoir.

The changes in bacterial numbers, relative growth rates, and glucose uptake were examined in the surface layer of Slapy Reservoir, Czechoslovakia, during several 24-hr observation periods at intervals of 3 or 6 hr and once daily at 4 to 6 week intervals from April to October. No diel periodicity was observed in microscopic and plate counts, but all other parameters studied displayed regular diel patterns. The range of diel variation increased with increasing algal production. The diurnal average relative growth rates, half-saturation constant plus original substrate concentration values, and turnover times were distinctly higher than nocturnal values. During periods of algal activity, characteristic diel changes were also noted in glucose uptake kinetics. In autumn samples, the diel changes in the bacterial net uptake rate of extracellular products were twice as high as the maximum glucose uptake rate. Diel variations were significantly lower than seasonal variations only for microscopic counts and maximum glucose net uptake rates. For other parameters, the diel and seasonal fluctuations were similar. (Geiger-FRC)
W83-03263

THE BIOTA OF OKLAHOMA SPRINGS: NATURAL BIOLOGICAL MONITORING OF GROUNDWATER QUALITY,
Oklahoma Univ., Kingston. Biological Station.
W. J. Matthews, J. J. Hoover, and W. B. Milstead.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222455, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Institute Completion Report, Oklahoma State Univ., Stillwater, May 1983. 64 p, 2 Fig, 4 Tab, 17 Ref, 1 Append. OWRT A-099-OKLA(1), 14-34-0001-1138.

Descriptors: *Fish, *Invertebrates, *Springs, Aquatic insects, Benthic fauna, *Bioassay, *Bioindicators, Groundwater, Groundwater reservoirs, Fish populations, Spring water, Stream biota, Sunfish, Aquatic animals, Aquifers, Benthos, Groundwater pollution, *Oklahoma.

A survey of the fishes and invertebrates of 49 Oklahoma springs, including locations in all major aquifers, was carried out in 1981 and 1982, with each spring sampled in both years. The objective of the research was to determine if faunal similarity was sufficiently great across years that spring community composition would be useful in biological monitoring of groundwater quality. (1) The total invertebrate community of springs generally showed high variation between the two years, and thus if not likely to be useful in a biological monitoring design for Oklahoma groundwater. (2) In contrast to the total invertebrate community, certain common and widespread invertebrates showed high stability of occurrence between years, and may thus represent viable choices for biological monitoring of water quality in springs. Included as potentially useful are: flatworms (Dugesia), snails (Physa), and the amphipod Hyalella azteca and the isopod Lirceus. (3) Fish were present in 17 of the springs, and showed higher stability of occurrence between years than did the invertebrate community. (4) A combination of native fishes that are common in springs and the invertebrates noted in No 2 above, might form the basis for a comprehensive plan of biological monitoring of water quality in springs and related aquifers in Oklahoma.
W83-03347

EXPERIMENTAL AND ANALYTICAL STUDY OF HEAT TRANSFER AND MIXING IN THERMALLY STRATIFIED BUOYANT FLOWS,
Purdue Univ., Lafayette, IN. Heat Transfer Lab.
R. Viskanta, and M. Behnia.
International Journal of Heat Mass Transfer, Vol 25, No 6, 1982, p 847-861, 13 Fig, 33 Ref. OWRT B-077-IND(8).

Descriptors: *Thermal stratification, *Heat transfer, *Thermal radiation, *Convection, *Water cooling, *Mixing, Stratification, Destrafication, Radiation, Cooling, Buoyancy.

Unsteady natural convection in a nonuniformly stratified, finite depth, layer of water heated from below was studied. Laboratory experiments were performed using a MachZehnder interferometer as a diagnostic tool for measuring temperature and a shadowgraph technique for flow visualization. A 1-dim. model in conjunction with a two-differential equation k-epilson turbulence model was used to predict the dynamics of the mixed layer which develops when the thermally stratified fluid is heated from below. Good agreement between data and predictions was obtained using the model. Unsteady natural convection heat transfer and mixing which occur when either a thermally stratified layer of liquid is cooled by air flow over the free surface or a layer of liquid is simultaneously heated by an external radiation source and cooled by air flow over the free surface or a layer of liquid is simultaneously heated by an external radiation source and cooled by air flow over the free surface was studied both experimentally and analytically. An unsteady 1-dim. model was developed for predicting the temperature structure in water irradiated by an external source and simultaneously cooled by air flow over the surface. Turbulent mixing was calculated using the k-epsilon model of turbulence. The results obtained show that deposition of radiation in water plays an important role on buoyancy and wind shear induced mixing processes in the surface layers during simultaneous heating by radiation and cooling by convection.
W83-03370

A SURVEY OF WATER TRANSPARENCY IN IOWA LAKES,
Iowa State Univ., Ames. Dept. of Animal Ecology.
For primary bibliographic entry see Field 5C.
W83-03371

CONTROL OF ALGAL DOMINANCE THROUGH CHANGES IN ZOOPLANKTON GRAZING, LAKE WASHINGTON: PHASE I,
Washington Univ., Seattle. Office of Public Archaeology.
For primary bibliographic entry see Field 5G.
W83-03467

BIOLOGICAL ROLE OF PERCH IN THE KREMENCHUG RESERVOIR,
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
Y. B. Zubenko.
Hydrobiological Journal, Vol 18, No 1, p 44-49, 1982. 3 Fig, 24 Ref.

Descriptors: *Perch, *Predation, *Fish diets, Fish food, Kremebchug Reservoir, *USSR, Pike, Reservoirs, Aquatic habitats, Aquatic populations, Fish populations, Fisheries, Food habits.

The perch population in the Kremenchug Reservoir, USSR, decreased the numbers of trash fish and served as food for the valuable species, pike-perch and pike. At the same time, perch did not reduce numbers of juveniles of valuable fish (white bream, wild carp, blue bream, roach). These conclusions were reached after examination of stomach contents of 557 mature perch, 193 pike, and 667 pike-perch in March-November 1971-72. It was estimated that in 1971 the perch diet consisted of 77.9% trash fish, 3.2% commercial fish, and 18.9% invertebrates. In 1972 the perch diet was 84.1% trash fish, 8.7% commercial fish, and 7.2% invertebrates. Perch catches were 70 tons in 1971 and 230 tons in 1972. Assuming that 1/3 of perch present were caught, the stock of trash fish destroyed by the perch was about 930 tons in 1971 and 3300 tons in 1972. Perch comprised 63.2% by weight of the stomach contents of pike-perch and 60.0% of pike. Only 0.9% of the perch stomach contents were juveniles of commercially valuable species. (Cassar-FRC)
W83-03472

MATERIAL AND ENERGY BALANCE OF ORGANIC MATTER IN THE WATERS OF THE RYBINSK RESERVOIR AND LAKE BAIKAL,
Akademiya Nauk SSSR, Borok. Inst. Biologii Vnutrennykh Vod.
B. A. Skopintsev.
Hydrobiological Journal, Vol 18, No 1, p 84-91, 1982. 4 Tab, 37 Ref.

Descriptors: *Organic matter, *Energy, Lakes, Oligotrophic lakes, Mesotrophic lakes, Lake Baikal, Rybinsk Reservoir, *USSR, Humus, Mineralization, Phytoplankton, Nutrients, Nitrogen, Phosphorus.

Material and energy balances of organic matter in two different types of lakes were determined using the bichromate method. Data from 1965 was used to compute the balances for Rybinsk Reservoir, a 25.4 cu km mesotrophic body with largely allochthonous aquatic humus of bog-soil origin. Annual organic inputs into Rybinsk Reservoir were 480,000 tons (4.1 quadrillion kilocalories) and 180,000 tons (1.8 quadrillion kilocalories) of autochthonous matter. Outputs from loss over the dam and mineralization were 450,000 tons of allochthononous matter and 160,000 tons of autochthonous matter. Balances for oligotrophic Lake Baikal, 22,160 cu km in volume, were computed from several published sources. Annual allochthonous organic matter input to Baikal was 304,000 tons (2.6 quadrillion kilocalories) and 3,968,000 tons (40 quadrillion kilocalories) of autochthonous organic matter. Outputs of allochthonous matter via discharge from the Angara River were 74,000 tons; of autochthonous matter, 4,179,000 tons by mineralization and 126,000 tons by burial in bottom sediments. Residence time of organic matter in Baikal was estimated at 50 years. In Baikal the organic forms of nitrogen and phosphorus were dominant over the mineral forms. This observation, in addition to very low chromaticity, confirmed the dominance of the planktonogenic fraction in Baikal aquatic humus. In Rybinsk the energy of the allochthonous aquatic humus was rapidly utilized in the vegetative period, producing a high bacterial biomass and enriching the water with nutrients and trace elements. This was not observed to a great extent in Baikal. (Cassar-FRC)
W83-03478

ZOOBENTHOS OF LAKES OF BLACK SEA RESERVATION (PRESERVE),
Akademiya Nauk URSR, Kherson. Black Sea State Preserve.
V. A. Pupkov.
Hydrobiological Journal, Vol 18, No 1, p 30-36, 1982. 3 Fig, 6 Tab, 8 Ref.

Descriptors: *Saline lakes, *Benthic fauna, *Invertebrates, Lakes, Black Sea Preserve, *USSR, Kinburn Spit, Seasonal variation, Biomass, Mollusks, Crustaceans, Polychaetes, Oligochaetes, Midges, Aquatic insects.

The zoobenthos of 18 lakes in the Kinburn spit and adjacent territory, south and west of the Dnieper River and north and east of the Black Sea, was studied in 1976-78. These shallow lakes, maximum depths of 1.5-2 m, classified as oligohaline (< 5 o/oo salinity), mesohaline, and ultrahaline (> 18.9 o/oo salinity). The bottom fauna included 31 invertebrate species (8 mollusks, 12 crustaceans, 4 polychaetes, 1 oligochaete, 4 chironomids, and some insect larvae). Species diversity was greatest in waters of 15.7 to 18.9 o/oo salinity. Most of these lakes were periodically in communication with the sea during wind tides. Species diversity was lowest in lakes with salinity > 30 o/oo. Chironomids, oligochaetes, and mollusks were common in oligohaline lakes. Abundance (individuals per sq m) varied as follows: oligohaline lakes, 1140 in summer to 6295 in winter; mesohaline lakes, 4460 in winter to 11,080 in summer; ultrahaline lakes, 740 in winter to 9560 in summer. Biomass (g per sq m) varied in the same patterns from 12.1 to 23.7, 21.3 to 105.9, and 0.32 to 15.8 in the three types of lakes, respectively. Total mean annual benthic invertebrate productions (kg per ha) were: oligohaline lakes, 4906; mesohaline lakes, 4443; and ultrahaline lakes, 864. (Cassar-FRC)
W83-03479

2I. Water In Plants

EFFICIENCY OF WATER USE BY CROPS UNDER ALLELOPATHY STRESS,
South Dakota Univ., Vermillion. Dept. of Biology.
F. A. Einhellig.
Water Resources Institute Completion Report, South Dakota State Univ., Brookings, February 1983. 51 p, 2 Fig, 6 Tab, 33 Ref, 5 Append. OWRT B-061-SDAK(1), 14-34-0001-0248.

Descriptors: Moisture uptake, *Weeds, Crop response, *Grain sorghum, *Soybeans, *Plant growth inhibitors, *South Dakota, Metabolism, Allelopathic stress, Plant stress.

The objective of this research was to determine the effects of allelopathic stress on water metabolism and growth of grain sorghum and soybeans. Experiments demonstrated that ferulic and p-coumaric acid treatments that reduced seedling growth also caused partial stomatal closure and a marked decrease in water potential. Combinations of t-cinnamic, ferulic, p-coumaric and caffeic acids resulted in synergistic inhibition of sorghum germination and growth. Further analyses showed one cultivar of sunflower, Interstate 894, and velvetleaf, Kochia, cocklebur and Jerusalem artichoke were allelopathic. Amendments of 1 g aqueous fresh-shoot extract in 120 ml nutrient media resulted in growth reduction in test seedlings. Likewise, sorghum seedlings grown in soil amended with 1 g of dried-weed extract in 80 g soil were stunted, and soybeans were inhibited in soil-pots containing 2 g : 80 g soil. Cocklebur was the most toxic weed. Extract-and residue-mediated growth reductions were accompanied by an increase in diffusive leaf resistance and/or a decrease in water potential, demonstrating that the allelopathic extract and residue components had activity similar to phenolic acids. Thus, exposure to water-soluble allelochemicals results in water stress in crop seedling, limiting productivity. It is feasible to minimize allelopathic effects on crop water metabolism and the consequential yield loss through avoidance management strategies.
W83-03313

AUTOMATED STRAIN GAGE DENDROGRAPHY FOR IMPROVED WATER UTILIZATION IN PLANTS,
Iowa State Univ., Ames. Dept. of Engineering Science and Mechanics.
C. P. Burger, D. B. Johnson, R. B. Hall, and R. C. Shultz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-224212, Price codes: A03 in paper copy, A01 in microfiche. Iowa State Water Resources Research Institute Completion Report No. 126, May 1983, 38 p, 19 Fig, 17 Ref. OWRT B-072-IA(4), 14-34-0001-8086.

Descriptors: *Water stress, *Transpiration, *Water utilization, *Dendrography, *Strain gages, Plant growth, Populus clone 5377, Soybeans, Crop yeilds, Automation, *Plant water balance.

A plant continually strives to maintain a balance between the water supply available to it and the evaporative demands made on it. The stem of the plant is an important link in this process. As the plant attempts to respond to changes in the balance between the supply and demand systems, the diameter of its stem varies continually; it contracts when water stress increases and expands when it decreases. If these small changes can be reliably measured, then the dynamic variations in stem size can be used as a measure of the water status of a plant with wide varying applications in the areas of

water management and research. This research developed a procedure whereby electrical resistance strain gages are used to continuously measure stem changes on plants. Experiments were conducted to relate such changes to plant water status and to investigate the influence of several parameters on the level of stress and also on the ways in which water stress affects the growth and the physiological responses of young trees of populus clone 5377 and of soybeans. The overall conclusion is that stem strains relate very closely to water stress and can be used to evaluate parameters for minimizing water needs and maximizing crop yields and water use efficiency.
W83-03372

2J. Erosion and Sedimentation

A STOCHASTIC MODEL FOR SUSPENDED SOLIDS SETTLING VELOCITY,
New Jersey Agricultural Experiment Station, New Brunswick.
C. G. Uchrin, and W. J. Weber, Jr.
Journal of Environmental Science and Health, Part A, Vol 18, No 1, p 103-124, 1983. 18 Fig, 12 Ref.

Descriptors: *Suspended solids, *Settling velocity, *Sedimentation rates, Clays, Model studies, Particulate matter, Suspended sediments, Flocculation, *Stochastic process.

A stochastic model for representing particle fall velocity distribution for suspended sediments was developed. Particle fall velocity was assumed to follow a log-normal distribution. Flocculation effects were accounted for by distribution parameters. The model allows use of steady state equations for quasi-time variable analyses. A 10 ft high, 5 inch deep column was used to empirically determine the fall velocity distribution parameters. Results of column settling tests with samples from several rivers and streams agreed well with predicted results. (Cassar-FRC)
W83-03158

MAIN RESULTS OF INVESTIGATING SILTATION OF THE RESERVOIR OF THE TEREBLYA-RIKA HYROELECTRIC STATION,
M. N. Bukhin, and I. I. Nazarov.
Hydrotechnical Construction, Vol 15, No 10, p 631-637, 1981-1982. 4 Fig, 2 Tab, 7 Ref. Translated from Gidrotekhnicheskoe Stroitel'stvo, No 10, p 47-50, October, 1981.

Descriptors: *Reservoir silting, *Silting, *Sediment transport, Tereblya-Rika Reservoir, *USSR, Mountains, Suspended sediments, Deposition, Carpathian Mountains.

The Tereblya-Rika hydrostation is the first and largest complex built in the mountain rivers of the Ukrainian Carpathians. This 5 km long, 300-400 m wide reservoir varies in depth from 1.5 m in the upper reach to 35.0 m at the dam. In the 24 years of its operation siltration has reduced its total storage volume by 9%, active storage by 4.6%, and dead storage by 25%. Although the mean annual siltration rate during the first 20 years was calculated by different investigators at 50,000-70,000 cu m, it increased to 205,000 cu m during 1975-79. This was caused by a lack of erosion control measures during construction in a basin draining into the river. Siltation was nonuniform. Deepest deposits (4-5 m) were in the widening part of the reservoir. Minimum deposition is in the bank zone, near the dam, and in the upper reach of the reservoir in the original river channel. Landslides and bank destruction account for < 2% of total siltation. (Cassar-FRC)
W83-03204

SEDIMENTOLOGIC STUDY OF THE MOUTH OF THE GABON RIVER ESTUARY (ETUDE SEDIMENTOLOGIQUE DE L'EMBOUCHURE DE L'ESTUAIRE DU GABON),
Omar Bongo Univ., Libreville (Gabon Republic). Dept. of Geology.
For primary bibliographic entry see Field 2L.
W83-03257

SURFACE IRRIGATION AS AFFECTED BY ASH FROM MOUNT ST. HELENS,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
L. G. King, and D. A. Peterson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-219998. Price codes: A06 in paper copy, A01 in microfiche. Water Reseach Center completion report, Washington State Univ., Pullman, November 1982. 97 p, 13 Fig, 25 Tab, 57 Ref, 2 Append. OWRT C-10112-V(1459)(1).

Descriptors: *Mount St. Helens, *Volcanic ash, Tephra, *Irrigation, Infiltration, Intake, Runoff, Irrigation efficiency, Furrow irrigation, Irrigation return flow, Sediment, Sediment basins, *Washington.

Field data (1979-1981), from a predominantly furrow-irrigated region in central Washington, are presented to evaluate the effect of Mount St. Helens ashfall from the May 18, 1980, eruption on several irrigation parameters. Volume balance relationships were used to determine furrow intake rates, runoff, and deep percolation losses for 175 sets of individual furrows over a range of field lenghts, slopes, stream sizes, and crop types. Irrigation return flow quality was also monitored, on both an individual-field and an area-wide basis, to delineate nutrient losses from this 800-hectare irrigated tract. Results indicate that no significant changes in furrow infiltration runoff rates were evident following incorporation of the 3 to 4 cm-thick ash layer. On an area-wide basis, the eruption also had a relatively short-lived impact on return flow quality, with increased sediment levels evident in tailwater return flows for only a 5-week period. Normalized sediment loss per volume of return flow leaving the study area was actually less, however, during the 1980 irrigation season than for either 1979 or 1981. Contributing factors were rapid incorporation of ash by cultivation, efficient entrapment of waterborne ash by relatively empty sediment basins, and better management of irrigation by area farmers.
W83-03285

EFFECT OF INCORPORATION OF FALL-APPLIED FERTILIZER ON RUNOFF LOSSES OF NUTRIENTS AND SOIL FROM SOYBEAN GROUND,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
J. L. Baker, and J. M. Laflen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220350, Price codes: A04 in paper copy, A01 in microfiche. Iowa State Water Resources Research Institute Completion Report No 123, Iowa State Univ., Ames, March 1983. 55 p, 6 Tab, 13 Ref, 1 Append. OWRT A-078-IA(1), 14-34-0001-0017.

Descriptors: *Nutrients, *Erosion, Runoff, *Conservation tillage, *Fertilization, Nitrogen, Phosphorus, Potassium, *Soybean residue, Nonpoint pollution sources, *Iowa.

Plot measurements of soil and nutrient runoff concentrations and losses were made for two simulated rains in the fall after soybean harvest and fertilization (N, P and K at 31, 35 and 80 kg/ha, respectively). The five treatments were: fertilizer surface-applied, no incorporation; fertilizer point-injected into the soil; fertilizer incorporated by chisel plowing; fertilizer incorporated by disking; and no fertilizer applied, no tillage. Chisel plowing reduced surface residue coverage from 82% (before tillage and the first rain) to 48%; disking reduced coverage to 31%. About half the residue buried by tillage was uncovered by the first rain. Sediment concentrations in runoff from the tillage plots were about three times higher than from the no-tillage plots. For rain 1 (111 mm), loosening the soil by tillage reduced runoff amounts, particularly from the chisel-plow treatment; for rain 2 (72 mm), runoff from the disked treatment was about three times that from the other treatments. Total soil loss from the disk treatment was 2.3 T/ha, which was at least three times higher than any other treatment. Concentrations of NH sub 4-N, P0 sub 4-P, and K runoff water and on sediment from treatments where fertilizer was incorporated by either point-injection or tillage were at the same levels as from the unfertilized treatment. Chemical concentrations from the surface-application-without-incorporation treatment were significantly higher than from all other treatments, particularly for the first rain (e.g., NH sub 4>0.9 mg/L, and K>18 mg/L). Total NH sub 4-N, P0 sub 4-P and K losses were also the greatest for the surface-application-without incorporation treatment, but were only 0.8, and 0.4 and 5.9 kg/ha, respectively.
W83-03298

EVALUATION AND MONITORING OF THE HYDROLOGIC IMPACT OF CABIN CREEK, B.C. COAL PIT MINING ON THE NORTH FORK OF THE FLATHEAD RIVER,
Montana Univ., Missoula. Dept. of Geology.
For primary bibliographic entry see Field 6G.
W83-03325

SOIL CONSERVATION AND THE REDUCTION OF EROSION AND SEDIMENTATION IN THE COON CREEK BASIN, WISCONSIN,
Geological Survey, Columbus, OH. Water Resources Div.
For primary bibliographic entry see Field 4D.
W83-03356

DYNAMIC MODELLING OF SUSPENDED SEDIMENT TRANSPORT IN STREAMS AS A FUNCTION OF SEDIMENT SUPPLY,
Oregon State Univ., Corvallis. School of Forestry.
J. VanSickle, and R. L. Beschta.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-224196, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Institute Publication WRRI-76, Oregon State University, Corvallis, May 1983. 37 p, 9 Fig, 1 Tab, 29 Ref, 4 Append. OWRT A-052-ORE(1), 14-34-0001-1139.

Descriptors: *Sediment transport, *Suspended load, *Suspended sediments, Sediment concentration, *Sediment discharge, *Sediment load, Watershed models, Hydrologic models, *Oregon, Flynn Creek, Huntington Creek.

Sediment supplies and stream discharge together determine the patterns, over time, of suspended sediment loads in small streams. Most of the uncertainty in empirical streamflow-sediment relationships can be attributed to changing supplies. Our transport model augments the commonly used power function relating suspended sediment concentration, C, to stream discharge, Q, by inclusion of a variable S representing sediment stored in the channel system. The resulting supply-based model was calibrated to concentration and streamflow time series data from four storm events in a small, forested watershed in coastal Oregon as well as to data from a controlled reservoir release in Utah, during which streamflow was held constant for an extended period. In all cases, the supply-based model followed observed concentration time series more accurately than did a transport model based on Q alone. We further enhanced performance of the supply-based model by distributing the total sediment supplies into several compartments which were accessed at different levels of stream discharge. Both the single-compartment and distributed-supply models demonstrate that a knowledge of sediment supplies can improve predictions of suspended sediment concentrations during storm runoff.
W83-03368

SEDIMENT DEPOSITION MODEL FOR RESERVOIRS BASED ON THE DOMINANT PHYSICAL PROCESSES,
Military Academy, West Point, NY. Science Research Lab.
T. L. Rice, and D. B. Simons.
Canadian Water Resources Journal, Vol 7, No 2, p 45-62, 1982. 3 Fig, 18 Ref.

Descriptors: *Model studies, *Reservoirs, *Sedimentation, Sediment transport, Erosion, Flood control, Irrigation, Planning, Maintenance, *Colorado, John Martin Reservoir.

A model is presented which forms the basis for reducing the present shortcomings found in current methods used to provide a reasonably accurate estimate of the losses of storage space within a reservoir. The general ideas behind the model are discussed along with the results of its application to John Martin Reservoir in southeast Colorado. The idea behind this model deviates from past general developments in that the physical processes found in the reservoir system are used as the basis for distributing sediment, rather than attempting to establish patterns based on distributions existing in similar reservoirs. These processes are fundamentally the same in each system. Thirteen separate processes which have a bearing on reservoir sedimentation have been identified and defined. Usable representations of the dominant processes of inflow, outflow, settling by size fraction, reservoir circulation, redistribution of deposited sediment, consolidation, density flows, and flocculation were created and integrated using a computer simulation based on the Fortran IV language. Processes neither considered significant in influencing the final sediment disposition nor included in the model development are backwater deposition, shore erosion, vegetation induced deposition, landslides, and wind deposition. Run-of-the-river, normally ponded, and semi-dry reservoirs can be modeled. This is the first general model that claims the capacity to model a semi-dry system. Application of the model to narrow reservoirs is not advised. (Baker-FRC)
W83-03417

A MODIFIED SEDIMENT TRANSPORT MODEL FOR NATURAL STREAMS,
Copenhagen Univ. (Denmark). Inst. of Geography.
T. Thomsen.
Nordic Hydrology, Vol 13, No 2, p 79-92, 1982. 5 Fig, 3 Tab, 20 Ref.

Descriptors: *Rivers, *Sediment transport, *Suspended solids, *Mathematical models, *Model studies, Natural streams, Velocity, Flow, Friction, Bed load, Sediment load, Mathematical equations, *Denmark.

In an earlier investigation of the behavior of tracer particles for determination of bed load transport in an alluvial stream, specific records were taken of the particle velocities in the upper bed layer. These data aroused the interest for more detailed investigations. The result of measuring surface particle velocities with radioactive tracers, performed in five West Jutland (Demark) localities with different hydraulic conditions in natural alluvial rivers, was used for determination of the relation: (migration velocity of the particle divided by the friction velocity due to skin friction times mean velocity flow times the relative density of the sediment grains) times the square root of the dimensionless bed shear due to skin friction divided by the critical dimensionless bed shear. The results obtained were inserted as the parameters of Engelund and Fredoe's sediment transport model from Fort Collins, Colorado. A good correlation was obtained between measured and calculated sediment transport rates. Future investigations aimed at improving the description of the transport expression and the effective mean fall velocity will improve the model; detailed in situ measurements of the total sediment transport in natural streams will offer a more qualified basis for model calibration. (Small-FRC)
W83-03494

2K. Chemical Processes

FORESTS, WETLANDS AND WATERFOWL POPULATIONS IN THE TURTLE MOUNTAINS OF NORTH DAKOTA AND MANITOBA,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W83-03181

THE POTENTIAL FOR ACID PRECIPITATION DAMAGE TO LAKES OF THE SIERRA NEVADA, CALIFORNIA,
California Univ., Berkeley.
For primary bibliographic entry see Field 5B.
W83-03182

THE CHEMISTRY OF GEOTHERMAL WATERS IN ICELAND. I. CALCULATION OF AQUEOUS SPECIFICATION FROM 0 TO 370C,
Iceland Univ., Reykjavik. Science Inst.
S. Arnorsson, S. Sigurdsson, and H. Svavarsson.
Geochimica et Cosmochimica Acta, Vol 46, No 9, p 1513-1532, September, 1982. 5 Fig, 9 Tab, 51 Ref.

Descriptors: *Thermal springs, *Minerals, Chemical properties, *Computer programs, *Speciation, Geothermal studies, Geysers, Geochemistry, Hydrogen ion concentration, Equilibrium, *Iceland.

A computer program was developed to calculate the composition and aqueous speciation of geothermal reservoir waters in Iceland. The program is designed to calculate pH, oxidation-reduction potentials, and gas partial pressures, and is specifically designed to handle geochemical data from wet-steam wells, hot-water wells, and boiling hot springs, although it may be adapted for use on non-thermal waters. Solubility data for selected geothermal minerals are included in the program to facilitate the study of solution/mineral equilibra. The program is useful in investigating chemical changes in the water following boiling, variable degassing and cooling, and how these changes affect solution/mineral equilibria. (Geiger-FRC)
W83-03201

RADIOELEMENTS, RADIOGENIC HELIUM AND AGE RELATIONSHIPS FOR GROUNDWATERS FROM THE GRANITES AT STRIPA, SWEDEN,
Royal Military Coll. of Science, Shrivenham (England).
For primary bibliographic entry see Field 2F.
W83-03208

EXTREME FRACTIONATION OF U234/U238 AND TH230/U234 IN SPRING WATERS, SEDIMENTS, AND FOSSILS AT THE POMME DE TERRE VALLEY, SOUTHWESTERN MISSOURI,
Geological Survey, Denver, CO.
B. J. Szabo.
Geochimica et Cosmochimica Acta, Vol 46, No 9, p 1675-1679, September, 1982. 2 Fig, 3 Tab, 18 Ref.

Descriptors: *Radioisotopes, *Uranium radioisotopes, Groundwater, *Geochemistry, *Spring water, *Sediments, Connate water, *Isotope fractionation, Geology, Isotope studies, Isotope tracers, Bogs, *Missouri.

The U234/U238 activity ratio in presently discharging spring waters, sediments, and fossils at the Pomme de Terre Valley of southwestern Missouri was measured to study the long-term effect of the ascending U234-enriched water on its surrounding depositional environment. The activity ratios of U234/U238 in five springs range from 7.2 to 16 in water which has been discharged for at least the past 30,000 years. Isotopic fractionation as great as 1600% was found between U234 and U238 in spring water, sediment and fossil samples. Clay units overlying the spring bog sediments of Trolinger Spring were enriched by as much as 720% in Th230 relative to their parent U234. These findings suggest that both preferential displacement by alpha recoil ejection and preferential emplacement by recoiling and physical entrapment are significant processes that are taking place in the geologic environment. The anomalies in the U234/U238 ratio in deep water may serve as a useful tool in hydrologic studies in southern Missouri. (Geiger-FRC)
W83-03209

POST-MINING NEUTRALIZATION OF ACIDIC SURFACE MINE LAKES,
Southern Illinois Univ. at Edwardsville. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W83-03278

RADON-222 IN POTABLE WATER SUPPLIES IN MAINE: THE GEOLOGY, HYDROLOGY, PHYSICS AND HEALTH EFFECTS,
Maine Univ. at Orono. Land and Water Resources Center.
C. T. Hess, C. V. Weiffenbach, S. A. Norton, W. F. Brutsaert, and A. L. Hess.
In: Proceedings Second Special Symposium on Natural Radiation Environment, 1981, Bhabha Atomic Research Center, Bombay, India, 1983. p 216-220, 4 Fig, 10 Ref. OWRT B-017-ME(3).

Descriptors: Carcinogens, Geology, Granites, Radioisotopes, *Maine, *Radon-22, *Potable water, Water supply, Water wells, Water analysis, Groundwater, Public health, *Pollutant identification.

Two thousand water samples from public and private drilled wells have been analyzed for super 222 Rn using liquid scintillation counting. Three hundred and fifty of these wells have been characterized in terms of geology, hydrology, and water chemistry. Twenty homes have been examined for ambient air-borne super 222 Rn using a diffusion alpha detector. Radon in water ranges from 20 to 180,000 pCi/l. Granites yield highest levels (X = 22, 100 pCi/l) with considerable inter- and intravariation. Meta-sedimentary rocks yield levels characteristic of the lithology for metamorphic grades ranging from chlorite to andalusite. Sillimanite (and above) grades yield higher 222 super Rn levels due to the intrusion of uranium-bearing pegmatites in these terranes. Public water supplies have super 222 Rn levels 1 to 2 orders of magnitude less than private drilled wells. Airborne super 222 Rn in homes ranges from 0.05 to 210 pCi/l. At the high end of this range dose rates exceed recommended industrial exposure. In some homes, only a small fraction of the total super 222 Rn is due to the water supply. Average super 222 Rn levels in domestic water supplies for 16 counties, calculated by a really averaging rock types and their associated super 222 Rn levels, correlate with total cancers, especially lung and reproductive cancers.
W83-03308

THE ROLE OF FULVIC SUBSTANCES ON TRACE METAL PARTITIONING IN NATURAL AQUATIC SEDIMENTS,
Massachusetts Univ., Amherst. Dept. of Chemistry.
O. T. Zajicek.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222844, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Center Publication No 140, Massachusetts University, Amherst, May 1983. 38 p, 13 Fig, 2 Tab, 12 Ref. OWRT A-127-MASS(1), 14-34-0001-0123.

Descriptors: *Hydrogen ion concentrations, Solubility, *Fulvic acids, Sediments, *Metals, *Carbonates, Carbonate rocks, *Soil chemical properties, Aquatic soils, Adsorption, Acidity, Alkalinity, Chemical precipitation, *Potentiometers, Cadmium, Copper, Iron, Manganese, Zinc, Oxides, Silica, Titration, *Volumetric analysis.

The effect of fulvic acids (1) on the solubility of the metal carbonates of copper, cadmium, manganese, and zinc, (2) on the adsorption properties of silica and pyrolusite, and (3) on the acid attack on ferric orthophate were investigated by means of distribution and potentiometric measurements. Metal carbonates were found to increase in solubility in waters containing fulvic acids proportional to the fulvic acid concentration. Metal concentrations obtained exceeded acceptable limits for aquatic systems. Metal ion adsorption on Si0 sub 2 and Mn0 sub 2 was essentially unaffected by pH over range 5-9. The addition of fulvic acids resulted in the desorption of the majority of the metal from Si0 sub 2, and to a much lesser extent, Mn0 sub 2. Ferric orthophosphate, FeP0 sub 4, was found to form in solutions of low pH. Formation of ferric oxide occurred at higher pH values than usual in the presence of phosphate and fulvic acids.

The fulvic acids appear to enhance solubilization processes by complexation of metal ions in solution. They aid or hinder the adsorption of metals on hydrous metal oxides, depending upon the relationship between the pH and the point of zero charge of the oxide substrate. Adsorption on silica is markedly affected by fulvic acids, and that on pyrolusite by both fulvic acids and pH.
W83-03348

METHODOLOGIES FOR EXTRACTION OF DISSOLVED INORGANIC CARBON FOR STABLE CARBON ISOTOPE STUDIES: EVALUATION AND ALTERNATIVES,
Geological Survey, Reston, VA. Water Resources Div.
A. A. Hassan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB82-257288, Price codes: A04 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 82-6, 1982. 51 p, 6 Fig, 8 Tab, 24 Ref.

Descriptors: *Stable isotopes, *Carbon radioisotopes, *Isotope studies, *Separation techniques, Water analysis, Chemical precipitation, Computers, Simulation analysis, *Gas evolution techniques, *Dissolved inorganic carbon.

The gas evolution and the strontium carbonate precipitation techniques to extract dissolved inorganic carbon (DIC) for stable carbon isotope analysis were investigated. Theoretical considerations, involving thermodynamic calculations and computer simulation pointed out several possible sources of error in delta carbon-13 measurements of the DIC and demonstrated the need for experimental evaluation of the magnitude of the error. An alternative analytical technique, equilibration with out-gassed vapor phase, is proposed. The experimental studies revealed that delta carbon-13 of the DIC extracted from a 0.01 molar NaHC03 solution by both techniques agreed within 0.1 per mil with the delta carbon-13 of the DIC extracted by the precipitation technique, and an increase of only 0.27 per mil in that extracted by the gas evolution technique. The efficiency of extraction of DIC decreased with sulfate concentration in the precipitation technique but was independent of sulfate concentration in the gas evolution technique. Both the precipitation and gas evolution technique were found to be satisfactory for extraction of DIC from different kinds of natural water for stable carbon isotope analysis, provided appropriate precautions are observed in handling the samples. For example, it was found that diffusion of atmospheric carbon dioxide does alter the delta carbon-13 of the samples contained in polyethylene bottles; filtration and drying in the air change the delta carbon-13 of the samples contained in polyethylene bottles; filtration and drying in the air change the delta carbon-13 of the precipitation technique; hot manganese dioxide purification changes the delta carbon-13 of carbon dioxide. (USGS)
W83-03359

RESULTS OF HYDROLOGIC TESTS AND WATER-CHEMISTRY ANALYSES, WELLS H-5A, H-5B, AND H-5C, AT THE PROPOSED WASTE ISOLATION PILOT PLANT SITE, SOUTHEASTERN NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
K. F. Dennehy, and J. W. Mercer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB82-263641, Price codes: A05 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 82-19, February 1982. 83 p, 18 Fig, 5 Tab, 6 Ref.

Descriptors: *Radioactive waste disposal, *Underground waste disposal, *Geohydrology, *Hydrologic data, Aquifer characteristics, Transmissivity, Storage coefficients, Water quality control, Test wells, Pumping tests, Water sampling, *New Mexico, Waste Isolation Pilot Plant.

Data were collected during hydrologic testing at wells H-5A, H-5B, and H-5C in the northeastern part of the proposed Waste Isolation Pilot Plant site in southeastern New Mexico. The three water-bearing zones tested, the Magenta and Culebra Dolomite Members of the Rustler Formation and the Rustler Formation-Salado Formation contact, yield water to wells at rates less than 0.6 gallon per minute. Throughout the testing, water-pressure response in the tested zone was monitored by a pressure-transducer system. Shut-in and slug tests were conducted to acquire data. Water samples from the Magenta Dolomite Member, Culebra Dolomite Member, and Rustler Formation-Salado Formation contact had dissolved-solids concentrations of 6,090, 144,000, and 412,000 milligrams per liter, respectively. The major chemical constituents of water samples from the Magenta Dolomite Member were sodium and sulfate; from the Culebra Dolomite Member, sodium and chloride; and from the Rustler Formation-Salado Formation contact, magnesium, and chloride. Radium-226, a naturally occurring radioactive element, was present in samples from all three zones. (USGS)
W83-03360

RESULTS OF HYDROLOGIC TESTS AND WATER-CHEMISTRY ANALYSES, WELLS H-6A, H-6B, AND H-6C, AT THE PROPOSED WASTE ISOLATION PILOT PLANT SITE, SOUTHEASTERN NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
K. F. Dennehy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-104042, Price codes: A05 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 82-8, January 1982. 68 p, 13 Fig, 5 Tab, 7 Ref.

Descriptors: *Radioactive waste disposal, *Underground waste disposal, *Geohydrology, *Hydrologic data, Aquifer characteristics, Transmissivity, Storage coefficient, Water quality control, Test wells, Pumping tests, Water sampling, *New Mexico, Waste Isolation Pilot Plant.

Hydrologic testing was conducted at 3 test wells in the northwestern part of the proposed Waste Isolation Pilot Plant site in southeastern New Mexico to define hydraulic properties of three water-bearing zones. The zones tested were the Magenta and Culebra Dolomite Members of the Rustler Formation and the Rustler Formation-Salado contact. The Rustler Formation and the contact yield water to wells at rates less than 0.5 gallon per minute as determined from shut-in and slug tests. These test methods were not applicable for the Culebra Dolomite Member of the Rustler Formation at well H-6B. A transmissivity value for the Culebra Dolomite Member was obtained by conducting a conventional pumping test. Well H-6B was pumped at a rate of approximately 11 gallons per minute. Throughout the testing of the Magenta Dolomite Member and the Rustler Salado contact, water-pressure response in the test zones were monitored by a pressure transducer system. Water samples from the Magenta Dolomite Member had a dissolved solids concentration of 5,760 milligrams per liter. The major chemical constituents of water samples from this zone were sulfate, sodium, and chloride. Water samples from the Culebra Dolomite Member and the Rustler-Salado contact had dissolved-solids concentrations of 52,600 and 316,000 milligrams per liter, respectively; chloride and sodium were the major constituents in the water samples. Radium-266, a naturally occurring radioactive element, was present in samples from all three zones. (USGS)
W83-03361

ENVIRONMENTAL ISOTOPIC AND HYDROGEOCHEMICAL INVESTIGATION OF RECHARGE AND SUBSURFACE FLOW IN EAGLE VALLEY, NEVADA,
Nevada Univ. System, Reno. Desert Research Inst.
For primary bibliographic entry see Field 2F.
W83-03380

EFFECTS OF COAL BURNING IN NEW MEXICO ON AIR QUALITY AND SURFACE WATER QUALITY: RATON STUDY AREA,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Chemistry.
C. J. Popp, R. W. Ohline, D. K. Brandvold, and L. A. Brandvold.
New Mexico Water Resources Research Institute Report No 157, Las Cruces, November 1982. 55 p, 7 Fig, 16 Tab, 32 Ref.

Descriptors: *Powerplants, *Water quality, *Surface water, *Acid rain, *Heavy metals, Coal, Trace elements, Precipitation, Particulate matter, Particle shape, Aerosols, Air pollution, Environmental effects, Small watersheds, Model studies, *New Mexico, Raton.

Acid precipitation has not been documented adequately in the Southwest and preliminary data indicate it may be a problem. The potential long-term effects on surface water and air quality were studied at this small power generating facility. The results may allow comparison for modeling to larger power plants. Coal combustion produces particulate matter that includes heavy metals and volatile, adsorbed trace metals, such as arsenic, cadmium, copper, lead, selenium and zinc. The particles may travel great distances before settling out or coming down with precipitation. Many of the precipitation samples were more acidic than predicted simply from carbon dioxide equilibrium, and the weighted average pH was 4.9 for wet-only precipitation. The deposited fly ash often has some elements in soluble form that could be concentrated on watersheds and ultimately further concentrated in bodies of water and biomagnified in aquatic life. Surface water samples in the Raton area seem to have normal trace metal content when compared to the Rio Grande in New Mexico. However, because some metals can be leached from fly ash by water, the ash should not be exposed to surface or groundwater supplies. A long-term extensive monitoring system for precipitation should be established and research efforts increased to identify the sources of the acid-causing material. Release of fly ash to the environment should be kept as minimal as possible, although no adverse environmental effects were noted in the study area. (Atkins-Omniplan)
W83-03382

'GEOTHERMAL MINERAL EQUILIBRIA.' REPLY TO A COMMENT BY M. A. GRANT,
Department of Scientific and Industrial Research, Petone (New Zealand). Chemistry Div.
W. F. Giggenbach.
Geochimica et Cosmochimica Acta, Vol 46, No 12, p 2681-2683, December, 1982. 1 Fig, 5 Ref.

Descriptors: *Geothermal studies, *Mineral water, Chemical reactions, Groundwater, Equilibrium, Temperature, Carbon dioxide, Partial pressure.

The author replies to a comment on 'Geothermal mineral equilibria.' The original paper was published in Geochimica et Cosmochimica Acta, Volume 45, pages 393-410, 1981, and the comment in Volume 46, pages 2677-2680, 1982. He states that the dominant process limiting carbon dioxide contents of high temperature geothermal fluids is the conversion of primary plagioclase by C02 to calcite and clay according to the equation described in the original paper. Errors in partial pressure of C02 can be produced by variations in activities of the anorthite and kaolinite components of the mineral phases. At lower temperatures the variations of C02 partial pressures are caused by secondary processes such as adiabatic expansion, conductive cooling, and mixing with cooler groundwaters. (Cassar-FRC)
W83-03416

ON THE LACK OF A UNIQUE RELATION BETWEEN C02 PARTIAL PRESSURE AND TEMPERATURE IN GEOTHERMAL SYSTEM. COMMENT ON 'GEOTHERMAL MINERAL EQUILIBRIA' BY W. F. GIGGENBACH,
Department of Scientific and Industrial Research, Wellington (New Zealand). Applied Mathematics Div.
M. A. Grant.
Geochimica et Cosmoschimica Acta, Vol 46, No 12, p 2677-2680, December, 1982. 2 Fig, 1 Tab, 31 Ref.

Descriptors: *Geothermal studies, *Mineral water, Carbon dioxide, Partial pressure, Temperature, Chemical reactions, Equilibrium, Groundwater.

A comment on 'Geothermal mineral equilibria,' published in Geochimica et Cosmochimica Acta, Volume 45, pages 393-410, 1981, states that a proposed equation relating temperature and carbon dioxide partial pressure in deep liquid in geothermal systems is not valid. The proposed relation is: log of the partial pressure of C02 = A - B/(t + 273), where A = 15.26 and B = 7850. Both high and low C02 partial pressures occur at both high and low geothermal temperatures. The mineral equilibria present are not significant compared to other effects. Within each field there is usually a correlation between gas content and temperature, reflecting adiabatic expansion of the deep liquid, which has a composition peculiar to the specific geothermal field. Giggenbach's data are not suitable because of adiabatic expansion, changes due to exploitation, and problems in data selection. (Cassar-FRC)
W83-03434

TRANS-BOUNDARY GEOTHERMAL RESOURCES OF TEXAS AND MEXICO,
Texas Univ. at Austin. Bureau of Economic Geology.
For primary bibliographic entry see Field 2F.
W83-03499

2L. Estuaries

WATER MIXING IN A TIDAL CURRENT AND THE EFFECT OF TURBULENCE ON TIDAL EXCHANGE THROUGH A STRAIT,
Kyoto Univ. (Japan). Geophysical Inst.
T. Awaji.
Journal of Physical Oceanography, Vol 12, No 6, p 501-514, June, 1982. 10 Fig, 15 Ref.

Descriptors: *Tidal currents, *Tidal effects, *Turbulent flow, *Mixing, *Straits, Flow, Tides, Stokes law, Water currents, Ocean circulation, *Japan, Estuarine environment.

Water particles released in a turbulent tidal current were numerically tracked, and the physical manner of the Lagrangian movement of particles was investigated to understand local mixing of water. The mechanism of tidal mixing in the inner and outer waters divided initially by a strait was investigated during three cylcles of the M2 tide with and without turbulence. In the vicinity of the strait, turbulence strongly affected the Lagrangian movement. This, in combination with a large Stokes drift, caused mixing of the particles initially adjacent. Turbulence had a minor influence on the water volume exchanged through the strait, but did greatly affect the area of the sea influenced by the tidal exchange. The dispersion coefficient determined from particle spread reached 8 times 10 to the 6th cm sq/sec in the vicinity of the strait. (Small-FRC)
W83-03159

THE ROLE OF DELAWARE RIVER FRESHWATER TIDAL WETLANDS IN THE RETENTION OF NUTRIENTS AND HEAVY METALS,
Rider Coll., Lawrenceville, NJ. Dept. of Biology.
R. L. Simpson, R. E. Good, R. Walker, and B. R. Frasco.
Journal of Environmental Quality, Vol 12, No 1, p 41-48, January/March, 1983. 2 Fig, 7 Tab, 40 Ref.

Descriptors: *Marshes, *Metals, *Nutrients, Fate of pollutants, Delaware River, Estuaries, Tidal marshes, Heavy metals, Phosphorus, Nitrogen, Wetlands, *New Jersey, Litter, Nonpoint pollution sources, Vegetation, Macrophytes, Aquatic plants, Accumulation, Bioaccumulation.

Nutrient and heavy metal budgets were determined for two New Jersey marshes in the Delaware Estuary in 1979. Nitrate was imported into the marshes in June, July, and November and exported in August and September. Nitrites and ammonium were imported in June, July, and August and exported in September and November. Organic N was imported in August and November and exported in September. Reactive phosphorus was imported in July, September, and November and exported in August. Total P was imported in July, August, and November and exported in June and September. Cd was always exported from the marsh. Cu, Ni, and Zn were imported except for 1 date each. Pb was imported in August-November and exported in June and July. Vegetation played a major role in retention of N, P, Cu, Pb, and Ni entering the marsh; concentrations of heavy metals in vegetation were higher in September than earlier in the growing season. Litter retained significant amounts of all heavy metals (1.5-4 times that in September vegetation) and nutients after macrophyte dieback. Nutrient and heavy metals levels in soil showed no seasonal patterns. (Cassar-FRC)
W83-03169

A SEASONAL STUDY OF THE DISTRIBUTIONS OF SURFACE STATE VARIABLES IN LIVERPOOL BAY. III. AN OFFSHORE FRONT,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
P. Foster, D. Voltolina, C. P. Spencer, I. Miller, and J. Beardall.
Journal of Experimental Marine Biology and Ecology, Vol 58, No 1, p 19-31, 1982. 7 Fig, 2 Tab, 13 Ref.

Descriptors: *Nutrients, *Salinity, *Phytoplankton, Estuarine environment, Liverpool Bay, Bays, Temperature, Water temperature, Coastal waters, Silicates, Nitrates, Fate of pollutants, Rivers, *England.

The presence of an intense density discontinuity running north-south was confirmed in Liverpool Bay during the winter of 1976-77. Consideration of salinity, temperature, and dissolved nutrients indicated a sharp line of demarcation between offshore and coastal waters. By March river discharge had accumulated near shore, producing a region of distinctly lower salinity and temperature, higher dissolved inorganic nutrients, and lower Si to total N ratios than offshore waters. In March the differences between offshore and inshore waters were 0.7C, 1.19 o/oo salinity, 219 micrograms nitrate-N per liter, and 184 micrograms Si per liter. These differences are related to the population dynamics of the phytoplankton. For example, the low silicate levels in inshore waters can be limiting to diatoms, and the low nitrate levels in offshore waters will be limiting to other organisms. (Cassar-FRC)
W83-03173

FORESTS, WETLANDS AND WATERFOWL POPULATIONS IN THE TURTLE MOUNTAINS OF NORTH DAKOTA AND MANITOBA,
North Dakota State Univ., Fargo. Dept. of Zoology.
R. E. Stewart, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-212290, Price codes: A10 in paper copy, A01 in microfiche. Water Resources Research Institute Completion Report, North Dakota State University, Fargo, January 1983. 196 p, 12 Fig, 45 Tab, 144 Ref. OWRT A-028-NDAK(1), 14-34-0001-3234.

Descriptors: *Waterfowl, *Wetlands, *Trees, Habitat, Shrubs, Water chemistry, Mallard duck, Canvasback duck, Blue-winged teal, Ring-necked duck, Shallow water, Terrestrial habitats, Freshwater marshes, Aspen trees, Oak trees, Elm trees, Ash trees, *North Dakota, *Manitoba, *Waterfowl.

The Turtle Mountains are an international aspen island in a sea of prairie Forests, wetlands and waterfowl of the Turtle Mountains were studied from 1967 through 1970. The orographic effect of the low escarpment may be ten inches of precipitation. The Manitoba portion is a virtual wilderness, while the North Dakota side is heavily farmed. Tax record analysis of land-use of the U.S. side indicates 45% of the land area was still forested in 1967; only 30% was ungrazed woodland. Class 3 to 5 wetlands (seasonal, semi-permanent and permanent) and waterfowl were studied on 80 quarter sections of land, 60 on the U.S. side from 1967-1970, and 20 on the Canadian portion from 1969-1970. A severe drought that persisted from summer 1967 to summer 1968 reduced total wetland acreage by 20%. Class 3 and 4 wetlands were reduced by 73 and 50%, respectively. Wetlands on the Canadian side tend to be more numerous per unit area, larger and have longer shore lines than wetlands on the U.S. portion. The number of Class 3 to 5 wetlands in the Turtle Mountains is estimated at 12,121 with 93,968 acres. Water chemistry determinations indicated wetlands had an average pH of 8.0 average alkalinity of 280 mg/L CaC0 sub 3 and an average specific conductance of 630 mmhos/cm super 3. Fifteen species of waterfowl were encountered during breeding pair and brood surveys. Statistical estimates of pair, brood and young density per section were made along with Highest Probability Density estimates of their precision, employing the Bayesian philosophy of statistics. On the average the U.S. side produced 95 pounds of young duck per section while the Canadian portion produced 185 pounds.
W83-03181

PRODUCTION OF INVERTEBRATES IN THE TIDEWATER ZONE OF A COASTAL RIVER AND ADJACENT ESTUARY,
Georgia Univ., Savannah. Marine Extension Service.
D. M. Gillespie, and J. C. Hodges, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-214932, Price codes; A04 in paper copy, A01 in microfiche. Environmental Resources Center Report No ERC 04-82, Georgia Institute of Technology, Atlanta, November 1982. 57 p, 5 Fig, 14 Tab, 30 Ref, 1 Append. OWRT A-065-GA(1), 14-34-0001-5010.

Descriptors: *Benthos, Coastal rivers, Currents, *Estuaries, *Estuarine environment, Euryhaline marine forms, Oligohaline upper reaches, Riverine species, Reversing currents, *Secondary productivity, Tidewater channels, *Georgia, Satilla River, St. Andrews Sound estuary.

The tidewater area of the Satilla River, and the adjacent St. Andrews Sound estuary were sampled to determine the distribution and production of estuarine invertebrates. Sampling in the Satilla tidewater area was carried out from December 1975 through November 1976, and included sand and mud benthos samples and plankton tows. Sampling in St. Andrews Sound extended from September 1976 through August 1977, and was restricted to benthos. Invertebrate distributions were analyzed and showed a predicted pattern of abundance, with euryhaline marine forms near the mouth of the estuary, estuarine forms dominating the brackish area and a few freshwater forms penetrating oligohaline upper reaches. Species diversity, density and biomass all appeared to be severly reduced in the tidewater area as compared to the sound and the non-tidal part of the river. Productivity in St. Andrews Sound was very high, and was dominated by sand-dwelling amphipods. Productivity of the non-tidal Satilla River, as determined in another study was also very high, but the tidewater zone of the river showed very depressed benthic productivity, although plankton production was moderate. The low diversity of such estuarine areas has been frequently found in other studies and was not surprising. The low biomass and productivity were, on the other hand, counter to conventional ecological wisdom, and were unexpected. In attempting to account for these results, it was found that the tidewater area is very unpredictable with regard to salinity as a result of rapid, irregular fluctuations in river discharge. It was also found that fauna in the freshwater tidal area were primarily riverine species adapted to consistent currents, and may be stressed by the reversible current in the tidewater channel. It is hypothesized that extremely low environmental predictability may be a factor in a reduced productivity, and also that production of riverine species may be restricted in tidal channels with reversing current. The low production in tidewater channels, if confirmed, is an indication of the stress under which biological communities in these areas exist.

We advise careful consideration before subjecting such stressed communities to additional impacts. W83-03183

COMPOSITION OF ESTUARINE COLLOIDAL MATERIAL: ORGANIC COMPONENTS,
Geological Survey, Reston, VA.
A. C. Sigleo, T. C. Hoering, and G. R. Helz.
Geochimica et Cosmochimica Acta, Vol 46, No 9, p 1619-1626, September, 1982. 4 Fig, 1 Tab, 42 Ref.

Descriptors: *Estuaries, *Colloids, *Organic matter, Rivers, *Chemical composition, *Polymers, Detritus, Microorganisms, Carbohydrates, Peptides, Proteins, Hydrocarbons, Phytoplankton, *Maryland, Patuxent River, Chesapeake Bay.

Colloidal material in the size range 1.2 nanometers to 0.4 micrometers was isolated by ultrafiltration from Chesapeake Bay and Patuxent River waters. Temperature controlled, stepwise pyrolysis of the freeze-dried material, followed by gas chromatographic-mass spectrometric analyses of the volatile products, indicates that the primary organic components of this polymer are carbohydrates and peptides. The major pyrolysis products at the 450 degrees step are acetic acid, furaldehydes, furoic acid, furanmethanol, diones and lactones characteristic of carbohydrate thermal decomposition. Pyrroles, pyridines, amides and indole (protein derivatives) become more prevalent and dominate the product yield at the 600 degrees pyrolysis step. Olefins and saturated hydrocarbons, originating from fatty acids, are present only in minor amounts. These results are consistent with the composition of Chesapeake phytoplankton (approximately 50% protein, 30% carbohydrate, 10% lipid and 10% nucleotides by dry weight). The pyrolysis of a cultured phytoplankton and natural particulate samples produced similar oxygen and nitrogen-containing compounds, although the proportions of some components differ relative to the colloidal fraction. There were no lignin derivatives indicative of terrestrial plant detritus in any of these samples. The data suggest that aquatic microorganisms, rather than terrestrial plants, are the dominant source of colloidal organic material in these river and estuarine surface waters. (Author's abstract)
W83-03202

SEDIMENTOLOGIC STUDY OF THE MOUTH OF THE GABON RIVER ESTUARY (ETUDE SEDIMENTOLOGIQUE DE L'EMBOUCHURE DE L'ESTUAIRE DU GABON),
Omar Bongo Univ., Libreville (Gabon Republic). Dept. of Geology.
P. Weydert, and O. Weydert.
Marine Geology, Vol 49, p 1-22, 1982. 14 Fig, 3 Tab, 25 Ref. English summary.

Descriptors: *Estuaries, *Tidal currents, *Navigable rivers, *Sedimentation, *Deposition, Tides, Tidal effects, Navigation, Sediments, Mud, Mud flats, Sand, Alluvium, Gabon River estuary, *Gabon.

Results of a study of the character and distribution of sediments at the mouth of the Gabon River estuary are presented. The Gabon is on the west coast of Africa. The mouth of the estuary comprises three sectors: 1) a wide and deep navigation channel containing fine, well-sorted sands due to the presence of strong tidal currents; 2) a broad shelf covered with muddy sands, due to tidal drainage from nearby mangrove swamps (this sector features large sand banks, weaker currents, and high turbidity); and 3) a hard ground in the middle of the estuary with biodetrital deposits. Based on these findings, a hypothesis regarding the navigation channel is presented. It is suspected that strong currents are promoting erosion of the bank, causing a shift away from the original alignment of the channel with the original river course. (Titus-FRC)
W83-03257

PARTICULATE MATTER RESUSPENSION VIA METABOLICALLY PRODUCED GAS BUBBLES FROM BENTHIC ESTUARINE MICROALGAE COMMUNITIES,
Florida Dept. of Natural Resources, St. Petersburg. Marine Research Lab.
M. J. Durako, R. A. Medlyn, and M. D. Moffler.
Limnology and Oceanography, Vol 24, No 4, p 752-756, July, 1982. 1 Fig, 3 Tab, 15 Ref.

Descriptors: *Estuaries, *Particulate matter, *Benthos, *Cycling nutrients, *Kinetics, *Suspended sediments, Nutrients, Algae, Benthic flora, Detritus, Marine sediments, *Florida, Tampa Bay, *Gas bubbles.

Cultures of Thalassia testudinum in the laboratory were observed to carry particulate matter to the water surface via metabolically produced gas bubbles originating from the sediments. The bubbles were assoicated with microalgae in the benthos, and particulate matter was resuspended after the bubbles burst after a few minutes. Gas bubble evolution and suspension of particulates were examined in gas/sediment traps in the laboratory. After a 24 hr-period, 307.9 milliliters of gas were evolved and 0.97 grams (dry weight) of particulate matter were resuspended under laboratory conditions. In situ studies in Tampa Bay, Florida yielded similar values for gas production, but showed higher loads of resuspended particulate. Chromatographic analyses of bubbles showed that the major component was photosynthetically produced oxygen. The resuspended particulate matter was 70-96% inorganic; the organic fraction was made up of detrital matter and living organisms. These findings may be important in studying the sediment kinetics and nutrient cycles of estuarine systems. (Geiger-FRC)
W83-03261

CHESAPEAKE BAY NUTRIENT AND PLANKTON DYNAMICS. 1. BACTERIAL BIOMASS AND PRODUCTION DURING SPRING TIDAL DESTRATIFICATION IN THE YORK RIVER, VIRGINIA, ESTUARY,
Lamont-Doherty Geological Observatory, Palisades, NY.
H. W. Ducklow.
Limnology and Oceanography, Vol 24, No 4, p 651-659, July, 1982. 4 Fig, 1 Tab, 15 Ref.

Descriptors: *Estuaries, *Destratification, *Mixing, *Nutrients, *Marine bacteria, *Biomass, *Tidal effects, Stratification, Chemical stratification, Salinity, Carbon, Aquatic productivity, Phytoplankton, *Virginia, York River estuary, Chesapeake Bay.

Bacterial abundance, biomass, and tritiated-thymidine incorporation rates were studied during spring tidal destratification of the York River, Virginia, estuary during August-September 1980. Monthly high spring tides caused salinity destratification in the moderately stratified estuary, which oscillates between stratified and vertically homogeneous conditions on a 1-10 day cycle. Bacterial abundance ranged from one billion to 8 billion cells/liter, and carbon biomass ranged from 20 to 100 micrograms/liter. Thymidine incorporation into cold trichloroacetic acid-insoluble fractions ranged from 1 billion to 10 billion moles/liter/day. Bacterial carbon production rates were estimated at 7-75 micrograms/liter/day, while specific growth rates were calculated to be between 0.2-1.1/day. During the destratification process, biomass increased steadily while production remained constant. However, during the period of maximum water-column homogeneity, production increased two-fold to threefold in 12 hr. Increased vertical mixing and stimulation of phytoplankton production were throught to be the major causes of this bacterial response to destratification. (Geiger-FRC)
W83-03264

CHEMICAL-QUALITY RECONNAISSANCE OF THE WATER AND SURFICIAL BED MATERIAL IN THE DELAWARE RIVER ESTUARY AND ADJACENT NEW JERSEY TRIBUTARIES, 1980-81,
Geological Survey, Trenton, NJ. Water Resources Div.
J. J. Hochreiter, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-151852, Price codes: A04 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigation 82-36, June 1982. 41 p, 6 Fig, 12 Tab, 52 Ref.

Descriptors: *Water quality, *Bottom sediments, *Path of pollutants, *Bottom sampling, Surface groundwater relations, Data collections, Chemical analysis, Trace metals, DDT, Pesticides, Polychlorinated biphenyes, Organic compounds, Salinity, *Delaware River, New Jersey, Pennsylvania, Delaware, EPA Priority pollutants.

This report presents chemical-quality data collected from May 1980 to January 1981 at several locations within the Delaware River estuary and selected New Jersey tributaries. Samples of surface water were analyzed Environmental Protection Agency 'priority pollutants,' including acid extractable, base/neutral extractable and volatile organic compounds, in addition to selected dissolved inorganic constituents. Surficial bed material at selected locations was examined for trace metals, insecticides, polychlorinated biphenyls, and base/neutral extractable organic compounds. Trace levels (1-50 micrograms per liter) of purgeable organic compounds, particularly those associated with the occurrence of hydrocarbons, were found in about 60% of the water samples taken. DDT, DDD, DDE, PCB's and chlordane are present in most surficial bed material samples. Diazinon was the only organophosphorous insecticide detected in the study (1.6 micrograms per kilogram at one location). High values for select trace metals in bed material were discovered at two locations. Of the 10 sites sampled, the surficial bed material containing the most contamination was found along one cross section of Raccoon Creek at Bridgeport. An additional analysis of Raccoon Creek revealed bed material containing toluene, oil and grease, and trace quantities of 15 base/neutral extractable organic compounds, including polynuclear aromatic hydrocarbons, phthalate esters, and chlorinated benzenes. (USGS)
W83-03363

RECOVERY AND TRANSPORT OF HEAVY METALS BY SPARTINA ALTERNIFLORA FROM DREDGING SPOILS,
Rhode Island Univ., Kingston. Dept. of Plant and Soil Science.
R. J. Hull, and J. R. Shann.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-224428, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Center Technical Report No 8, Univ. of Rhode Island, Kingston, September 1982. 23 p, 10 tab, 6 Ref. OWRT A-074-RI(1), 14-34-0001-1142.

Descriptors: *Spartina, Estuaries, Dredging, Cadmium copper, Nickel, Zinc, *Tidal marshes, Estuarine environment, *Rhode Island, Narragansett Bay, Sediments, *Metals, *Salinity, Absorption, *Path of pollutants.

The capacity of smooth cordgrass (Spartina alterniflora Loisel.) a dominant grass of Atlantic tidal salt marshes, to transport heavy metal from sediments to estuarine waters was studied. The DTPA extractable heavy metal content of marsh sediments from upper Narragansett Bay was correlated with the metal content of S. alterniflora growing in those sediments. The plant zinc content correlated well with the extractable zinc levels in the sediments. The plant content of cadmium, copper and nickel was best correlated with the sediment content of other metals. Plant cadmium was particularly well correlated with sediment zinc. The mobility of cadmium and zinc within S alterniflora was determined in solution cultured plants grown in 0 and 15 ppt NaCl. Salinity reduced the root absorption rate of cadmium and zinc by almost 50%. Translocation of zinc from roots to shoots was reduced by salinity while cadium transport was not affected. Both metals were phloem mobile translocating from leaves to roots and other sink regions. The presence of these metals on leaf surfaces following root absorption, indicated elimination from leaves via salt glands. These findings demonstrate that heavy metal absorption and transport occurs in S. alterniflora which can serve as a vector of

heavy metals from tidal marsh sediments to estuarine waters.
W83-03381

AGGREGATION OF COLLODIAL IRON DURING ESTUARINE MIXING: KINETICS, MECHANISM, AND SEASONALITY,
Maine Univ., Walpole. Dept. of Geological Sciences.
L. M. Mayer.
Geochimica et Cosmochimica Acta, Vol 46, No 12, p 2527, 2535, December, 1982. 8 Fig, 40 Ref.

Descriptors: *Iron, *Mixing, *Colloids, Estuaries, Kinetics, Seasonal variation, *Organic matter, Particulate matter, Suspended solids, Temperature effects, *Agregration.

The colloid chemistry of iron and humic aggregation was studied in a series of laboratory experiments, which were related to seasonal aggregation extent data collected in a temperate estuary. Kinetically, the aggregation of iron occurs with a rapid initial reaction which is complete within a few minutes, followed by an extensive, slow second reaction, which lasts for several hours. Organic carbon aggregation, however, occurs primarily in the first reaction. The first reaction is perikinetic, while the second reaction is observed to be either perikinetic or orthokinetic, depending on the pore size of the filter used to clarify the suspension. The second reaction involves aggregation of small filtrable colloids (< 0.5 microns) with larger aggregates formed in the first reaction, and follows pseudo-second order kinetics with respect to the filtrable iron concentration when finer filters (< 0.5 microns) are used for clarification. Little or no temperature dependence is evident for the first reaction extent, while increasing temperature strongly enhances the second reaction. An activation energy of 9-11 kcal per mole for the second reaction is due to a combination of trnsport and charge repulsion terms. Field data show a correspondingly greater aggregation extent of iron with salinity in warmer months relative to colder months. (Author's abstract)
W83-03450

PYRITE AND OXIDIZED IRON MINERAL PHASES FORMED FROM PYRITE OXIDATION IN SALT MARSH AND ESTUARINE SEDIMENTS,
Kean Coll. of New Jersey, Union. Dept. of Chemistry-Physics.
G. W. Luther, III, A. Giblin, R. W. Howarth, and R. A. Ryans.
Geochimica et Cosmochimica Acta, Vol 46, No 12, p 2665-2669, December, 1982. 4 Fig, 1 Tab, 27 Ref.

Descriptors: *Iron compounds, *Sediments, *Marshes, Salt marshes, Marine sediments, Estuaries, Chemical reactions, Pyrite, Sulfur compounds, Iron sulfide, Oxidation, Great Sippewissett Marsh, Massachusetts, Hackensack Meadowlands, New Jersey, Newark Bay, Sapelo Island, Georgia, Vegetation, Crystals, Framboids.

Sediments from vegetated portions of three salt marshes (Great Sippewissett on Cape Cod, Massachusetts; Sapelo Island, Georgia; and Hackensack Meadowlands, New Jersey) and from Newark Bay, New Jersey, Estuary were examined by scanning electron microscopy and energy dispersive X-ray analysis. Pyrite particles were abundant in sediment from all sites. They were found as framboids (5-40 microns, average 15 microns) and fine grained crystals (0.2-2.0 microns, average, 0.5 microns). Single crystals predominated in all samples of marsh sediments, strong evidence for rapid formation of pyrite. Microcrystalline and framboidal iron oxyhydroxides were found in many sediment samples, suggesting that pyrite oxidizes within the sediment and that iron is conserved in salt marshes during pyrite oxidation. Iron and zinc were found in oxidized framboids from Newark Bay. Crystalline iron oxyhydroxide phases were not detected in Sapelo Island sediments. The red amorphous coating on Spartina alterniflora roots from Sapelo and Sippewissett contained ferric iron (probably as oxide or hydroxide) as the major consituent, with some sodium chloride, goethite, and quartz. A proposed iron cycle in the pore waters of marsh sediments explains both the seasonal variations in amounts of pyrite found in marsh sediments and the low iron concentrations in pore waters. (Cassar-FRC)
W83-03451

HYDROBIOLOGY OF THE LITTORAL ZONE OF THE DNIEPER ESTUARY UNDER CONDITIONS OF REGULATED FLOW OF THE RIVER,
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
For primary bibliographic entry see Field 6G.
W83-03480

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

BARGE-MOUNTED PLANT FOR DESALINATION: AN ECONOMICAL ALTERNATIVE FOR PROVIDING DRINKING WATER IN ARID REGIONS,
Buckau-Walther A.G., Essen (Germany, F.R.).
K. Wangnick.
Water and Waste Treatment, Vol 25, No 3, p 28, 30, 32, March, 1982. 3 Fig.

Descriptors: *Desalination, *Evaporation, Arid lands, Barges, Flash evaporation, Drinking water.

A mobile seawater desalination plant was built to supply drinking water for islands and construction sites in arid regions. Mounted on a 60 m long, 18.5 m wide self-propelled barge, the 1250 cu m per day unit includes 2 flash evaporators. Diesel oil is the source of heat for operating the unit as well as for propulsion. The plant was built in Europe and will be towed to the Middle East. A floating plant has several advantages over an onshore plant: shorter construction time; no roads, buldings, harbors or piers required; lower startup and trial operation costs; easier accessibility to fuel: lower cost per unit of drinking water produced; and the ability to move from one site to another. (Cassar-FRC)
W83-03179

FINAL RESULTS OF TESTING OF ABCOR 8 INCHES SPIRAL WOUND ULTRA-FILTERS AT THE WRIGHTSVILLE BEACH TEST FACILITY,
RCA Service Co., Camden, NJ.
L. H. Fleming.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220319, Price codes: A07 in paper copy, A01 in microfiche. Completion Report, June 1983. 108 p, 6 Fig, 4 Tab, 5 Append. OWRT C-00030-D(No 9405)(1).

Descriptors: *Seawater, *Membrane processes, *Water treatment, *Ultrafiltration, *Field tests, *Filters, Seawater filtration, Ultrafilters.

Utilizing 8 inches diameter spiral wound ultrafilter elements, an experimental system for the pretreatment of seawater was constructed and evaluated. Several different sets of operating conditions were tested. Three main parameters which varied were filtrate conversions, module flowrate and seawater temperature. Experimentally, it was found that there was no significant difference in the productivity between test runs with high module flowrates and those with low flow-rates. Low fifteen minute plugging indices of the filtrate indicate that ultrafilters are capable of supplying excellent feedwater. The energy consumption and productivity for a large system utilizing 48 eight inch spirals were projected. Operating at a transmembrane pressure of 100 psi and conversion of 90% the production rate for this seawater system would be 590,000 gpd at 75% and the specific energy consumption of the filtrate would be 2.2 Kwhr/Kgal. after 3600 hours of testing no degradation in the performance or condition of the ultrafilters were evident.
W83-03288

PARAMETRIC STUDY OF SEAWATER REVERSE OSMOSIS DESALTING PLANTS,
Bechtel Group, Inc., San Francisco, CA.
R. Soo-Hoo, S. May, and L. Awerbuch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220608, Price codes: A09 in paper copy, A01 in microfiche. Completion Report, January 1983. 180 p, 32 Fig, 70 Tab, 39 Ref, 2 Append. OWRT C-10141-D(No 1486)(1).

Descriptors: *Reverse osmosis, *Cost analysis, *Desalination, *Seawater, *Desalination plants, Membranes, Design criteria, Cost estimates, Pumps.

A comprehensive parametric technical and economic study on seawater reverse osmosis desalination plants was conducted to derive updated costs for seawater reverse osmosis plants ranging in capacity from 1000,000 gpd to 5 million gpd at a Carribean site and at a Continental U.S. site. The study considers hollow-fiber and spiral-wound membranes in one and two-pass configuration, various seawater intakes (surface, water well, Ranney collector), various high pressure pumping systems (centrifugal, positive displacement), optional energy recovery systems (Pelton wheel, reverse-running pumps, flow work exchanger), and operation and maintenance labor requirements. Process flow diagrams, piping and instrumentation diagrams, material lists, and plant layout diagrams were developed. Conceptual capital and operating cost estimates were prepared for the various base and parametric case plants to determine the product water costs.
W83-03316

ORGANIC ABSORBENTS FOR TRIPLE POINT ABSORPTION FREEZE CRYSTALLIZATION PROCESSES,
J. A. Heist.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222406, Price codes: A03 in paper copy, A01 in microfiche. Final Report, 1982. 34 p, 7 Fig, 3 Tab, 6 Ref. OWRT C-00247-D(1427)(1).

Descriptors: *Computer models, *Desalination, *Freezing, *Phase diagrams, *Waste heat, Construction materials, Corrosion, Equilibrium, Feasibility studies, Heat balance, Hydrocarbons, Immiscibility, Organic compounds, Pilot plants, Thermodynamics, Vapor pressure, *Absorbents, AFVC process, Absorption freeze vapor compression process, WHAF Process, Waste heat absorption freeze process.

Calculations were made to predict the absorption characteristics of various classes of organic molecules. Pertinent absorption refrigeration characteristics were found to be water-absorbent composition, miscibility of the absorbent and absorbed water, and the volatility of organic during regeneration operations. A number of absorbents were identified that could be used in the OWRT Absorption Freeze Vapor Compression (AFVC) pilot plant. The most promising materials are dicarboxylic acids (i.e., glutaric acid) and diols (tetraethylene glycol). Calculations to characterize the properties of these absorbents indicate that either would substantially improve operation of the AFVC pilot plant, which is limited by heat transfer surface area. Either of these materials will operate to allow greater mass and heat transfer driving forces than the present sodium chloride absorbent. Use of tetraethylene glycol is recommended ror the AFVC pilot plant at the Wrightsville Beach Test Facility. A method is presented for obtaining experimental water partial pressure data; this will confirm experimentally, before the organic absorbent is charged to the AFVC pilot plant, the temperature and concentration dependence of the water partial pressure in the absorbent solution. The tetraethylene glycol presents no handling hazards, is nontoxic, and is compatible with the materials in the AFVC pilot plant.
W83-03341

A CENTER FOR THE TRANSFER OF DESALINATION TECHNOLOGY,
Fairleigh Dickinson Univ., Teaneck, NJ. Coll. of Science and Engineering.
W. Arthur.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-223057, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, June 1983. 43 p, 6 Fig, 4 Append. OWRT C-00101-D(No 0447)(1).

Descriptors: *Desalination, *Technology transfer, *Training, Brackish water, Chlorination, Electrodialysis, Reverse osmosis, Sea water, St. Croix, *Virgin Islands.

The Center was established at the Fairleigh Dickinson University, West Indies Laboratory, St. Croix, U. S. Virgin Islands. The main purpose was to demonstrate both the technical and economic merits of desalination to industry and the public at large. Primary emphasis was given to seawater desalting by reverse osmosis and brackish water conversion by electrodialysis. Research was conducted on pretreatment of raw seawater without employing acid and with a chlorine starvation technique. In addition, operators and engineers received hands-on training as the Center was used for both credit and non-credit educational courses. W83-03352

BARRIER EFFECT OF VARIOUS METHODS FOR DESALINATING SEAWATER IN THE PRESENCE OF CHEMICAL POLLUTANTS (OBEZZARAZHIVAYUSHCHII EFFEKT RAZLICHNYKH METODOV OPRESNENIYA MORSKOI VODY V USLOVIYAKH EE KHIMICHESKOGO ZAGRYAZNENIYA),
Institute of General and Municipal Hygiene, Moscow (USSR).
Yu. A. Rakhmanin, Yu. G. Talaeva, and Yu. H. Nikitina.
Gigiena i Sanitariia, No 2, p 15-18, February, 1982. 10 Ref. English summary.

Descriptors: *Reverse osmosis, *Desalination, *Enterobacteria, *Pathogenic bacteria, *Distillation, Bacteria, Water treatment, Bioindicators, Oil pollution, Oily water, Seawater, Escherichia coli.

Distillation and reverse osmosis are the most reliable seawater desalination techniques as far as the elimination of pathogenic enterobacteria is concerned. The accumulation of pathogenic and indicator bacteria in desalinated water is influenced by the pollution of the initial water by surface active substances and oil products. In the course of desalination, the conventional indirect indices of water epidemiological safety, such as the coli-index and the total number of microorganisms, are not always meaningful. Determination of enterobacteria content should be carried out directly in the desalinated water. This is especially true when the surface-active substances or oil products contents of the initial seawater exceed the MAC by 10 times or the coli-index is greater than 1000. (Small-FRC) W83-03404

FABRICATION OF A 6,000 GPD INDIRECT FREEZING PILOT PLANT: VOL. 1,
Chicago Bridge and Iron Co., Oak Brook, IL.
J. S. Andrepont.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-226829, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, October 1982. 20 p, 2 Fig, 6 Ref. OWRT C-00153-D(NO 0459)(1), 14-34-0001-0459.

Descriptors: *Desalination, *Freezing, Indirect contact, *Pilot plant, *Fabrication, *Desalination plants, Heat transfer, Design, Specifications, Design Criteria, Costs, Operations.

The indirect contact heat transfer freeze desalination process is presented and described. The scope of a contract for fabrication of a nominal 6000 gallon per day pilot plant is discussed. The design basis is reviewed and specifications and drawings are included to document the as-built facility. The check-out of the plant is reviewed and operation and maintenance are briefly discussed. Costs incurred during fabrication are briefly presented and the cost estimate for plant start-up and testing is reviewed. Five appendices are included in Volume II: (1) process design assumptions; (2) major equipment specifications; (3) electrical interlock description; (4) paint and lubricant specifications; (5) safety plan. As-built engineering and construction drawings are included in Volume III. W83-03462

THE START-UP AND TESTING OF A 6,000 GPD INDIRECT FREEZE DESALINATION PILOT PLANT,
Chicago Bridge and Iron Co., Plainfield, IL.
C. M. Heavener, and T. J. Nowak.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-226886, Price codes: A09 in paper copy, A01 in microfiche. Completion Report, March 1983. 59 p, 13 Fig, 3 Ref, 5 Append. OWRT C-10066-D(NO 1456)(1), 14-34-0001-1456.

Descriptors: *Desalination, *Indirect freezing process, *Pilot plant, Start-up, Testing, *Desalination plants, Operations, Brine, *Heat transfer, *Vertical tube crystallizers.

The report describes the techniques used to start-up, test, and evaluate an indirect freezing process using a pilot plant operating on a synthetic brine solution. Heat fluxes, overall heat transfer values, required temperature differentials and maximum ice production were determined in the operational testing of the falling film vertical tube crystallizer. The need for better quality control on the preparation of heat transfer surfaces was established and a new tube fabrication specification was prepared. Operating and control parameters for the pilot plant were determined for the optimum slurry flow rate, salinity of brine to the crystallizer, ice fraction to the wash column and water needed for ice washing. Additional research is indicated in several areas of mechanical design for the freezer, wash column, and separators. W83-03468

3B. Water Yield Improvement

GROUND WATER QUANTITY AND QUALITY IN FRACTURE ZONES IN ABBEVILLE COUNTY, SOUTH CAROLINA,
Clemson Univ., SC. Dept. of Chemistry and Geology.
D. S. Snipes, G. G. Padgett, W. B. Hughes, and G. E. Springston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-226860, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Institute Publication No 102, Clemson Univ., S. C., June 1983. 54 p, 8 Fig, 8 Tab, 16 Ref, 2 Append. OWRT-A-053-SC(1), 14-34-0001-1143, 2143.

Descriptors: *Fracture Permeability, *Well data, Aerial photographs, Topographic maps, Groundwater, Bacteria, Chemical analyses, Dissolved solids, Hardness, Alkalinity, *South Carolina, Abbeville County, Water yield.

The coherent igneous and metamorphic rocks of Abbeville County in the Piedmont of South Carolina, are virtually impermeable except in fracture zones where their permeability is much better. Satellite imagery, aerial photographs, and topographic maps were analyzed in order to locate lineaments and fracture traces which are potential ground water bearing fracture zones attributed to systematic joints, faults or fold axes. These features were investigated in the field to confirm or deny that they were natural ones. More than 200 lineaments and fracture traces were mapped. The water wells situated in lineaments had a median yield of 35 gpm and the wells in fracture traces had a median of 25 gpm. In contrast, the wells located in unfractured rocks had a median of 5 gpm and 23% of these wells had yields of less than 2 gpm or were dry holes. Thus, the probability of obtaining a good to excellent well is much better on lineaments or fracture traces than it is for randomly situated ones. Seventy-one ground water samples were analyzed chemically. Ninety-five % of the samples were characterized by low total dissolved solids, hardness, alkalinity, chloride, Ca, Mg, Mn and Zn. The pH varied from 5.5 to 8.0 with a median of 6.6 Twenty-four of 71 samples had pH values which were less than 6.5, the lower limit recommended by SC DHEC. No bacteria were observed in six samples from drilled wells, but large concentrations were observed in all four of the samples from hand dug wells and in two out of three bored ones. W83-03466

3C. Use Of Water Of Impaired Quality

EFFICIENT UTILIZATION OF INDUSTRIAL WASTER AND WASTE HEAT FOR INTENSIVE FISH PRODUCTION (DIE RATIONELLE NUTZUNG VON INDUSTRIEWASSER UND ABWARME FUR EINE INTENSIVE FISCHPRODUKTION),
VEB Binnenfischerei, Wermsdorf (German D.R.).
U. Seidlitz.
Wasserwirtschaft-Wassertchnik, Vol 32, No 8, p 274-275, 1982. 1 Tab. (No English Summary).

Descriptors: *Industrial water, *Fisheries, *Aquaculture, *Raw water, *Water temperature, Carp, Coal, Trout, Indicators, Bioindicators, Fish diets, Fish food, Growth, Fish management, Fish populations, Fish stocking.

Experience with fish production in industrial and cooling waters is recounted. Five installations near Leipzig and ten more throughout East Germany are Currently raising fish in industrial wastewaters for stocking or harvesting. Trout, carp, and plant-eating species have been successfully raised in such waters. With a fresh water input of about 300 cu m/hr in an open recirculating system, about 30 tons of carp or 20 tons of trout can be harvested annually. High quality mixed feed is required to optimize yield. Adequate influent monitoring is necessary, since process disturbances may affect the fishery operation before becoming otherwise apparent. It is possible to produce carp on a year-round basis, due to their water temperature requirements; optimal water temperatures range from 20 to 23 degrees centigrade for carp and 12 to 16 degrees centigrade for trout. High levels of pollutants in influent water sometimes become limiting factors for fish growth. (Titus-FRC) W83-03221

A COMPUTER MODEL FOR PREDICTING THE IMPACT OF IRRIGATING WITH SALINE WATER ON SOILS AND RUNOFF WATER IN MISSOURI,
Missouri Univ.-Columbia. Dept. of Agronomy.
W. R. Teague, P. G. Koenig, A. Barakah, and R. W. Blanchar.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-219980, Price codes: A04 in paper copy, A01 in microfiche. Missouri Water Resources Center Completion Report, Univ. of Missouri, Columbia, January 1983. 65 p, 32 Fig, 14 Tab, 32 Ref, OWRT A-119-MO(1), 14-34-0001-0127.

Descriptors: *Irrigation water types, *Salinity, *Acid soils, Water quality, Soil physical properties, Leaching, *Soil water movement, Hydraulic conductivity, *Missouri, Model studies, Computer models, Runoff.

A study was undertaken to determine the potential impact of irrigating acid, loess derived soils with high salt/high sodium waters. The study was partly motivated by increasing practice of supplemental irrigation on soils overlying marginal quality groundwater aquifers and having moderately low available water holding capacities. A rudimentary data base, consisting of well water quality data (U. S. Geological Survey) and a period of record of solar radiation, precipitation and air temperature (SOLMET) was accessed and used to initiate a modeling effort. Hydraulic properties of remolded loess derived soil materials were studied as func-

tions of clay content (12 <% clay 41). Water content corresponding to a given value of matric potential increased with increasing clay content with one exception; for soils having 12 % and 20 % clay, this trend reversed for matric potentials higher than -60kPa. Within limits of experimental error, diffusivity and hydraulic conductivity were found to be exponential functions of water content over the matric potential range covered in the study. Saturated conductivity (falling head) decreased with increasing clay content and with increasing bulk density (1.3 to 1.4 gcm super -3). W83-03284

OPTIMUM IRRIGATION LOADING RATES OF HIGHLY SALINE WASTEWATER ON A MONTMORILLONITIC SOIL,
South Dakota State Univ., Brookings. Water Resources Research Inst.
J. H. Bischoff, and C. G. Carlson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222166, Price codes: A08 in paper copy, A01 in microfiche. Completion Report, May 1983. 166 p, 29 Fig, 18 Tab, 19 Ref, 9 Append. OWRT A-072-SDAK(1), 14-34-0001-9044.

Descriptors: *Land management, *Irrigation water, *Water reuse, Wastewater disposal, Wastewater use, Brackish water, Alkaline water.

Annual applications of 125, 90, and 50 cm of secondary-treated municipal effluent were applied to a 0.76 cm/hr glaciated soil growing alfalfa for 3 years. All treatments had weekly applications with the depth of application varying from 1.5-3.2 cm for the low rate plot to 3.8-8 cm for the high plot. The amounts applied paralled the evapotranspiration curve of the crop with weekly applications lowest in the spring and fall and highest during the summer. Water quality varied from 1500-3000 mu Siemens/cm for the electrolyte concentration, from 5-11 for the sodium adsorption ratio, and from 0.1-12.4 ppm for nitrate nitrogen. A water table developed within 1.2 meters of the surface for the 90 cm plot (treatment 35G) and within 1.1 meters of the surface on the 125 cm plot (treatment 50) at the end of the second irrigation season. Treatment 50 had lost 1-2% of the plant population at the end of the second year and 15-20% by the end of the third year of irrigating. Leaching fractions of 0.08-0.10 for total moisture should not be exceeded to prevent water table problems from developing near the surface. Annual soil applications of gypsum were added to the 90 cm plot (treatment 35G) to determine the efficiency in removing exchangeable sodium from the soil colloid exchange sites. After two annual applications of powdered gypsum, no significant difference between the gypsum plot (treatment 35G) and the non-gypsum plot (treatment 35) was detected in the top 1.2 meters. However, the sodium level for 35G in observation wells at the center of the plot were 2-5 times higher than the non-gypsum plot (35) with the same annual rate of effluent. Sulfate levels were 4-8 times higher on 35G versus 35 and magnesium was 4 times higher.
W83-03327

WATER QUALITY OF AIRPORT STORM RUNOFF,
Hawaii Univ. at Manoa, Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W83-03353

WATER REUSE IN THE COASTAL PLAIN OF NEW JERSEY - A CASE STUDY,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Chemical and Biochemical Engineering.
R. C. Ahlert.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-224386, Price codes: A02 in paper copy, A01 in microfiche. Center for Coastal and Environmental Studies Completion Report, May 1983. 9 p, 6 Ref. OWRT A-059-NJ(1), 14-34-0001-0132/1132.

Descriptors: *Water reuse, Water supply, Wastewater renovation, Water deficit, *New Jersey, Coastal plains, Manasquan River basin, Recharge, Water quality criteria, Wastewater treatment.

Eastern Monmouth County has an increasing water deficit, as evidenced by declining aquifer levels and increasing salinity. Waste water reuse through aquifer recharge was considered a possible alternative to surface water development. Surface water development in the Manasquan River Basin would involve reuse through treated effluent transport in surface waters to impoundments or potable water intakes. Recharge lagoons and irrigation requirements could not provide adequate capacity. Water quality criteria would mandate considerable tertiary treatment before injection and mixing with ground water. Water Plant 21 is an example of complexity and cost for treatments prior to reuse via aquifer. A dual distribution system concept would provide some relief of demand of potable water. Treated waste water can be used for many non-potable, non-contact purposes.
W83-03378

THE USE OF INDUSTRIAL WASTE WATER. I. AERIAL AND SOIL MICROCLIMATIC MODIFICATIONS DUE TO HEATING BY WASTEWATER (20 DEGREES C) CIRCULATING IN BURIED PIPES (UTILISATION DES EAUS DE REJET EN AGRICULTURE, I. MODIFICATIONS MICROCLIMATIQUES DUES AU CHAUFFAGE DU SOL PAR TUYAUX ENTERRES, EN PLEIN CHAMP)
Institut National de la Recherche Agronomique, Versailles (France). Station de Bioclimatologie.
A. Baille, and M. Mermier.
Agricultural Meteorology, Vol 22, No 1, p 23-34, July, 1980. 8 Fig, 2 Tab, 9 Ref. English summary.

Descriptors: *Heated wastewater, *Soil temperature, *Powerplants, Nuclear powerplants, Primary productivity, Crop yield, Nuclear powerplants, Primary productivity, Crop yield, Wastewater management, Waste heat, Wastewater farming, Wastewater disposal.

Wastewater from thermal or nuclear power stations might be employed for agricultural purposes. One such use consists of soil heating by circulating wastewater in buried pipes. It is necessary to determine the order of magnitude of the microclimatic modifications introduced by this heating process. Microclimatic measurements (temperatures, radiative balance) were made in two open field cultivated plots, one heated by buried pipes with water at 20 degrees C, and the other non-heated. On a very cold night (temperature at 10 cm above the soil, 2-8C) an average temperature elevation of 2 deg. C was achieved. This would not be sufficient to protect the crops against a hard freeze. Modifications of the thermal regime were significant in the soil (temperature as well as fluxes) but negligible in the air above 20 cm. Thus, greater benefits in terms of earlier maturation and productivity are to be expected for underground cultures such as asparagus, potatoes, and similar crops. (Baker-FRC)
W83-03388

PROBLEMS OF IRRIGATED AGRICULTURE IN AL-HASSA, SAUDI ARABIA,
Regional Centre for Animal Nutrition and Breeding, Hofuf (Saudi Arabia).
Z. Hussain.
Agricultural Water Management, Vol 5, No 4, p 359-374, December, 1982. 9 Fig, 1 Tab, 26 Ref.

Descriptors: *Irrigation practices, *Springs, *Salinity, *Saudi Arabia, Salt, Crop yield, Sugarbeets, Barley, Water management, Water supply development, Irrigation.

Al-Hassa, often referred to as the largest and oldest oasis in the Arabian Peninsula, is located in the eastern part of Saudi Arabia. Not long ago the area under intensive cultivation in Al-Hassa was as large as 20,000 ha. However, poor drainage initiated a process of gradual but continuous decline in soil productivity. During the late 1960's, 32 springs were integrated to form the present Al-Hassa Irrigation and Drainage Authority; work was completed in 1971. A recent study showed that the total discharge from the springs was 219 million cubic meters per year. The water is of a high salinity and is not suitable for irrigation under normal conditions, but only under very careful soil management. In the Al-Hassa Irrigation and Drainage Authority, management of drainage water for agricultural use has been under consideration as a possible means of enlarging the area under cultivation. Several studies were carried out to determine the long-term effects of using highly saline water for irrigation. Experiments applying irrigation water with a salinity level ranging from 1555 to over 5000 mg/liter were carried out for the test crop, alfalfa, over a 3 year period. Crop yield was reduced by about 18% in plots treated with water of salinity 3800 mg/liter, as compared with the plots irrigated with normal water. Sugar beet, Rhodes grass and barley could be grown when the salinity level was less than 400 mg/liter. It is concluded that the construction of effective irrigation and drainage facilities and their proper exploitation in areas affected or endangered by secondary salinization is the most vital and urgent problem of irrigated agriculture in the Al-Hassa oasis. (Baker-FRC)
W83-03391

3D. Conservation In Domestic and Municipal Use

THE CONCORD WATER SURVEY,
New Hampshire Univ., Durham. Water Resources Research Center.
L. C. Hamilton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-223040, Price codes: A04 in paper copy, A01 in microfiche. Research Report No 38, January 1983. 68 p, 8 Fig, 10 Tab, 14 Ref, 3 Append. OWRT A-061-NH(3), 14-34-0001-2131.

Descriptors: *Water conservation, *Survey, Residential, Evaluation, *New Hampshire, Concord, *Water shortage, Water use, Domestic water supply, Attitudes.

The city of Concord, New Hampshire, experienced a serious water shortage in 1980-81. An energetic conservation campaign was evidently successful, as city-wide use declined by some 15% during the shortage. This study uses data from a mailed survey questionnaire, combined with information from Water Department billing records, to examine the predictors of water conservation in a random sample of 431 Concord households. The most important single predictor of household conservation is baseline, preshortage water use. The greater the pre-shortage use, the greater the use reduction, in both absolute and in percentage terms. This effect remains strong even with more than twenty other variables in the model. The most important steps taken to conserve water are indoors, behavioral changes such as less flushing of toilets, shorter showers, shallower baths, etc. Reductions in outdoors water use were almost universally claimed by these households, so this variable cannot account for within-sample variations in conservation. The indoors, behavioral changes are most closely related to idealistic, rather than economic, motives for saving water. Idealistic motives are highest among younger, more affluent, and better-educated households. Economic motives, in contrast, are higher among less affluent and educated households, with larger numbers of children. People citing economic motives may actually have conserved less water than others. This study represents the first attempt to construct a full causal model for household water conservation. The findings have implications both for water-conservation program design, and for the direction of possible future research.
W83-03351

3E. Conservation In Industry

WATER REUSE AND RECYCLING IN THE TEXTILE INDUSTRY,
Environmental Technology Consultants, Inc., Fairfax Station, VA.
J. C. Dyer, J. S. Whang, and J. F. Judkins, Jr.

Available from the National Technical Information Service, Springfield, VA 22161 as PB83-212266, Price codes: A09 in paper copy, A01 in microfiche. Completion Report RU-83/1, U.S. Dept. of the Interior, Bur. of Reclamation, Washington, D.C., April 1983. 163 p, 33 Fig, 8 Tab, 25 Ref, 3 Append. OWRT C-10014-R(No 2402)(1), 14-34-0001-2402.

Descriptors: *Recycle, *Reuse, *Textile industries, Water usage, Wastewater characteristics, *Water reuse.

An assessment was made of the current extent of water reuse and recycling within the Textile Industry and areas were identified for increased utilization of reuse and recycling modes of operation. An overview of water usage within the Textile Industry is presented. The two largest subcategories--woven fabric finishing and knit fabric finishing--represent approximately 80-85% of the wet-processing mills in the U.S. and approximately 80% of these large water users are located in the Mid-Atlantic and South-Atlantic-Gulf regions. A summary of the nine major product classes with process and wastewater characteristics is presented Applicable waste treatment technologies are summarized and a computer model to be used by management in planning reuse/recycle options is presented. Four detailed case histories on actual operating mills, utilizing various recycle modes of operation, are included. The areas identified for future research activities include: refined management tools including computer models, actual minimum feed water quality parameters for major water-using processes, cost-effective alternative treatment technologies, and development of effective in-plant modifications coupled with new process equipment.
W83-03178

3F. Conservation In Agriculture

AGRICULTURAL IRRIGATION TECHNOLOGY TRANSFER ASSESSMENT,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
C. A. Marro, E. M. Roe, and W. E. Sharpe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-219956, Price codes:A04 in paper copy, A01 in microfiche. Completion Report, February 1982. 49 p, 5 Append. OWRT C-00192-T(No 0496(2), 14-34-0001-0496.

Descriptors: *Technology transfer, *Agricultural irrigation, *Irrigation efficiency, *Technology transfer products, *User needs assessment, Products strengths, Product weaknesses, Users identified, Western U.S., Southeastern U.S.

The assessment of agricultural irrigation technology transfer begins with a short history of irrigation and a discussion of problems caused by inefficient irrigation methods. A description of the search strategy--which included a literature search, consultation with computerized information files, contact with irrigation experts and government agencies--follows. Groups and individuals who may use agricultural irrigation technology are identified and characterized by number and geographical distribution. User needs, such as technical level of information or publication format, are discussed. Significant research and technology transfer products, along with strengths and weaknesses are included. The Federal or State agencies, associations or corporations which produced the products are listed. A section is devoted specifically to technology transfer produced in the Southeast because many products and programs have been produced in the region. The need for efficient irrigation water use in the southeast is not as serious as it is in the western states. Therefore, this section is the only part of the assessment which discusses the eastern U. S. Recommendations are made for five technology products and programs. Format, topic outlines, and cost-benefit analyses are included where appropriate. Supplemental appendix sections list interested government agencies, names and addresses of contacts, journals, associations, and technology transfer products.
W83-03281

CONSERVATION OF SOIL, WATER, ANDD ENERGY THROUGH REDUCED TILLAGE SYSTEMS - PHASE I SUB 1,
Nebraska Univ.-Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W83-03287

LANDSAT MONITORING OF IRRIGATED FARMLAND ACREAGE IN CURRY COUNTY, NEW MEXICO,
New Mexico Univ., Albuquerque. Technology Application Center.
For primary bibliographic entry see Field 7A.
W83-03310

TILLAGE AND IRRIGATION MANAGEMENT PRACTICES FOR OPTIMUM CROP PRODUCTION,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
D. W. DeBoer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222182, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Institute Completion Report, South Dakota State Univ., Brookings, March 1983. 68 p, 26 Fig, 16 Tab, 45 Ref. OWRT A-076-SDAK(1), 14-34-0001-0144.

Descriptors: Irrigation, *Cultivation, Conservation tillage, *Sprinkler irrigation, Runoff, Infiltration, Rates of application, Water management, *Chiselling, Irrigation efficiency, Crop response, *South Dakota.

Field studies dealing with the management of reduced pressure sprinkler irrigation technology were conducted in South Dakota. The objectives of the studies were to evaluate the characteristics of the experimental sprinklers and companion tillage practices. Eight sprinkler devices (impact sprinklers, a vortex nozzle and spray nozzles on booms and on top of the pipe with operating pressures ranging from 41 to 344 kPa) were field tested on a silt loam soil. The maximum application intensities were influenced by climatic conditions and sprinkler device selection. High application uniformities were obtained with high and low pressure sprinkler devices. The reduced pressure sprinklers produced increased application intensities, increased surface runoff and decreased soil water contents for conditions of the study. No corn yield differences were detected among the experimental sprinkler devices because the irrigation management practices used in the study maintained adequate soil water contents. Three primary tillage (plow, disc and till-plant) treatments and one secondary tillage practice were evaluated under reduced pressure sprinkler irrigation. The disc treatment produced 35% less runoff than the plow and till-plant treatments. The plow and till-plant treatments produced comparable amounts of runoff. The plow treatment had less soil water available for crop use than the disc and till-plant treatments. The plow treatment caused a 1.4 mg/ha corn yield reduction when compared with an average of the other tillage treatments. The secondary tillage practice reduced surface runoff by 63%, increased soil water contents and increased corn yields by an average of 0.5 mg/ha.
W83-03329

WATER AND ENERGY CONSERVATION USING CENTER PIVOT IRRIGATION AND REDUCED TILLAGE SYSTEMS,
Nebraska Univ.-Lincoln. Dept. of Agricultural Engineering.
J. R. Gilley, L. N. Mielke, and W. W. Wilhelm.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222398, Price codes: A05 in paper copy, A01 in microfiche. Nebraska Water Resources Center Completion Report, Lincoln, October 1982. 83 p, 19 Fig, 27 Tab, 11 Ref. OWRT B-048-NEB(1), 14-34-0001-9120.

Descriptors: *Water conservation, *Center-pivot irrigation, *Energy conservation, *Irrigation efficiency, *Nebraska, Mathematical models, Reduced pressure, Sprinkler irrigation, Water quality.

The basic goal of this project was to develop and evaluate crop production systems which have the potential to reduce both water and energy consumption in irrigated agriculture without adversely affecting water quality. A combination of field experimentation and computer modeling was undertaken to determine the quantity and quality of runoff water from reduced-pressure center-pivot irrigation systems, to determine the water and energy savings from these systems, to develop mathematical models of these systems, and to determine the feasibility of using these systems in other locations. Reducing the pressure of center-pivot systems can save significant amounts of energy; however, improper site selection for some types of these systems may result in increased runoff. The increased runoff will lower the irrigation efficiency and the potential energy savings will be reduced, nullifying part of the energy savings gained through pressure reduction. The incorporation of modified tillage practices will greatly reduce the runoff problem. Mathematical models of the water application characteristics of center-pivot systems and soil infiltration rates were used to develop criteria for proper site selection of reduced pressure systems. These criteria can be used to determine the feasibility of using the various reduced pressure devices as a function of soil intake families.
W83-03342

EFFECT OF IRRIGATION AND HARVESTING DATES ON THE YIELD OF SPRING-SOWN SUGAR-BEET,
Naples Univ. (Italy). Inst. of Agronomy.
G. Barbieri.
Agricultural Water Management, Vol 5, No 4, p 345-357, December, 1982. 5 Fig, 4 Tab, 21 Ref.

Descriptors: *Irrigation practices, *Crop yield, *Sugar-beet, Irrigation, Water supply development, Water supply, Evaporation, Temperature effects, Rainfall, *Italy, Sele River Plain.

A 2-year trial study was conducted on sugar-beet sown in the spring in the Sele River Plain in Southern Italy. During the study 4 watering regimes were compared in factorial combination with two harvesting dates. In addition to no irrigation, three different irrigation schedules were applied during the growing season. These were based on the net accumulated pan 'A' evaporation, the crop coefficient and an irrigation cycle coefficient. During the first year, highest yields of roots and sucrose were obtained with the largest water depths (555 and 655 mm for the two irrigation daies), applying short irrigation cycles. In the second year, with intermediate water depths of 300 and 350 mm and intermediate irrigation cycles, highest yields were obtained. Irrigation increased mean weight and size of roots and decreased sucrose percentage. A 1 month delay in harvest increased mean weight, sizes and yield of roots and decreased the sucrose percent although the final sucrose yield was not changed. (Baker-FRC)
W83-03383

A METHOD FOR APPLYING CROP SENSITIVITY FACTORS IN IRRIGATION SCHEDULING,
Demokritos Univ. of Thrace, Xanthi (Greece). Dept. of Civil Engineering.
G. P. Tsakiris.
Agricultural Water Management, Vol 5, No 4, p 335-343, December, 1982. 2 Fig, 1 Tab, 22 Ref.

Descriptors: *Irrigation practices, *Crop production, Moisture stress, *Sorghum, *Irrigation, Water supply development, Water management.

Attention is focused on the parameter representing crop sensitivity in a production function. A method is presented for modification of this parameter, derived from experiments, to make it suitable for application in irrigation practice. The procedure is illustrated using data for grain sorghum. Using Jensen's production function a method was devised for estimating crop sensitivity to water deficiency at given time intervals. The sensitivity index was closely related to the duration of the suppression of evapotranspiration. Thus, values of

the sensitivity index encountered in the literature without specifying the exact duration of the corresponding period have qualitative rather than quantitative validity. These values should not, therefore, be used for optimization purposes. The method proposed has the great advantage of simplicity. This is mainly achieved by disregarding the complicated interdependence between the stages of growth. Due to this simplification the volume of data required for constructing such a production function can be substantially reduced. The method is suitable for use in the design and operation of irrigation systems. It permits considerable flexibility in selecting the irrigation interval to take into account the various climatic and soil conditions. It may be used to optimize the intraseasonal irrigation water distribution for a single crop when the available irrigation water for the season is limited. (Baker-FRC)
W83-03384

PROBLEMS OF IRRIGATED AGRICULTURE IN AL-HASSA, SAUDI ARABIA,
Regional Centre for Animal Nutrition and Breeding, Hofuf (Saudi Arabia).
For primary bibliographic entry see Field 3C.
W83-03391

IRRIGATION WATER CONSERVATION BY USING WIDE-SPACED FURROWS,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
J. F. Stone, H. E. Reeves, and J. E. Garton.
Agricultural Water Management, Vol 5, No 4, p 309-317, December, 1982. 4 Tab, 7 Ref.

Descriptors: *Irrigation practices, *Crop yield, *Furrow irrigation, *Water conservation, Water requirements, Sorghum, Water stress, *Oklahoma.

Wide furrow irrigation, which can reduce water requirements by 20-50%, was studied in 1977 and 1978 in a grain sorghum field in Goodwell, Oklahoma, to develop management practices for avoiding crop yield reductions commonly reported with this technique. Yield reductions were not encountered if the wide-spaced furrow irrigation method was abandoned for normal (every furrow) irrigation methods on August 1 of a high water stress year or if the furrows were irrigated alternately. A high stress year was identified by examining wind velocity and rainfall for the period July 15 to August 1. If rainfall average was $<$ 1.6 mm per day and wind average was $>$ 1.8 m per sec during this two-week period, the irrigation program was immediately changed to every-furrow irrigation or alternate furrow irrigation. (Cassar-FRC)
W83-03408

ANALYSIS OF BASIN IRRIGATION PERFORMANCE WITH VARIABLE INFLOW RATE,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
J. M. Reddy, and W. Clyma.
Agricultural Water Management, kVol 5, No 4, p 295-308, December, 1982. 10 Fig, 5 Tab, 12 Ref.

Descriptors: *Irrigation efficiency, *Flow rate, *Variability, Basin irrigation, Surface irrigation, Model studies, Mathematical models, Performance evaluation, Design criteria, Developing countries, *Egypt, Semiarid lands, Water conservation.

Variability in irrigation flow rate did not lower the performance of a basin irrigation system when the average flow rate was greater than or equal to the design flow rate. These results were obtained by using data from two Egyptian field sites in a mathematical model, the zero-inertia model of surface irrigation. Three patterns of flow variation (sinusoidal, initially low then high, and initially high then low) were studied. On sandy loam soil the distribution uniformity was reduced at 0.75 times design flow, and water did not reach the end of the field at 0.5 times the design flow. The clay loam field had acceptable performance even at half of the design flow rate. If average flow rates are not high enough, the basin size can be reduced to achieve the desired application efficiency and distribution uniformity. (Cassar-FRC)
W83-03410

FORECASTING METHODS IN THE FUTURE SUPPLY AREA OF THE RHEINTAL WATER TRANSMISSION NETWORK (BEWEISSICHERUNGSVERFAHREN IM KUNFTIGEN WASSERGEWINNUNGSGEBIET DES ZWECKVERBANDS FERNWASSERVERSORGUNG RHEINTAL (FWR),
Zweckverband Fernwasserversorgun Rheintal, Sinsheim (Germany, F.R.).
J. Thon, and P. Feilmann.
Gas- und Wasserfach: Wasser/Abwasser, Vol 122, No 2, p 41-44, February, 1981. 2 Fig, 1 Tab, 4 Ref. English abstract.

Descriptors: *Crop yield, *Crop production, *Available water, *Infrared imagry, *Aerial photography, Agriculture, Cropland, Photography, Computers, Forecasting, Prediction, Weather data collections, Federal Republic of Germany.

In a test area of 11.4 sq km with varying soil conditions, agricultural yields were determined before and after the removal of 1000 to 2000 liters/sec of water for a long distance water supply. The purpose was to determine possible reductions in agricultural yields and to develop a method to compensate for the loss in yield. A new procedure was used which involves the computerized evaluation of infra-red aerial photographs taken with false-color film. The procedure was standardized using the yields of small test fields. Also, a method for forecasting crop yields based on weather data was applied for the first time on a regional basis. This method has proven useful for the determination of average yields for various countries. (Author's abstract)
W83-03456

TECHNOLOGY ASSESSMENT OF IRRIGATION SCHEDULING AND CROP RESPONSE,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
W. A. Hall.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-226902, Price codes: A06 in paper copy, A01 in microfiche. Completion Report, February 1982. 102 p, 8 Fig, 3 Tab, 168 Ref, 2 Append. OWRT C-00179-T (No 0472)(1), 14-34-0001-0472.

Descriptors: Agriculture, *Crop production, *Farming, Irrigation, *Irrigation effects, *Irrigation practices, *Technology assessment, *Irrigation scheduling, Crop yeild.

During the 1970s decade, the United States underwent a dramatic shift in the political philosophy for irrigation planning and management, from one of continually seeking to augment the existing supplies of irrigation water to one of better utilization and management of those supplies already developed. This change in emphasis has been neither complete nor without controversy, primarily because the relevant science and technology implicitly required for the rational evaluation of the new philosophy is largely undeveloped. It is the objective of this technology assessment to evaluate the requirements which must be met if the new philosophy is to serve national objectives most effectively, to assess the current state of the related science and technology, and to recommend research and development programs which will be required. The basic issues are the amount, timing and uniformity of the application of irrigation water to the fields and the consequences thereof. These issues are important to a number of questions relevant both to good farm water management and to the implications of various proposed national water policies.
W83-03488

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

EFFECT OF HYDOUT AND AQUATHOL K ON HYDRILLA IN GATUN LAKE, PANAMA,
H. E. Westerdahl.
Journal of Aquatic Plant Management, Vol 21, p 17-21, January, 1983. 7 Fig, 2 Tab, 13 Ref.

Descriptors: *Herbicides, *Aquatic weed control, *Pesticide residues, *Pesticide kinetics, Aquatic weeds, Lakes, Canals, Macrophytes, Aquatic plants, Lake sediments, Plant tissues, *Panama, Gatun Lake.

Three equivalent treatment rates of two endothall formulations (27, 34, and 50 kilograms/hectare of Aquathol K and Hydout) were effective at controlling hydrilla in treatment plots of the Frijoles Bay area of Gatun Lake , Panama. Aquathol K provided control within 24 to 72 hr posttreatment at each application rate while Hydout required 14 to 21 days before hydrilla decline was evident at the two higher application rates. Herbicide dispersion from the Aquathol K treated area was evident during the first three days after application. Persistance of endothall in water of treated plots was less than 7 days. Endothall persistence in sediment and plant tissue from treated plots was about 3 and 7 days, respectively, for Aquathol K and over 21 days for Hydout. (Geiger-FRC) thin 24 to 72 hr posttreatment at each application rate while Hydouapplication rates. Herbicide dispers ion from the Aquathol K treated area was evident during the first three days after application. Persistence of endothall in water of treated plots was lessthin 24 to 72 hr posttreatment at each application rate while Hydouapplication rates. Herbicide dispers ion from the Aquathol K treated area was evident during the first three days after application. Persistence of endothall in water of treated plots was lessthin 24 to 72 hr posttreatment at each application rate while Hydouapplication rates. Herbicide dispers ion from the Aquathol K treated area was evident during the first three days after application. Persistence of endothall in water of treated plots was less than 7 days. Endothall persisr Aquathol K and over 21 days for Hydout. (Geiger-FRC)
W83-03162

THRESHOLD 2,4-D CONCENTRATIONS FOR CONTROL OF EURASIAN WATERMILFOIL AND SAGO PONDWEED,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Lab.
H. E. Westerdahl, and J. F. Hall.
Journal of Aquatic Plant Management, Vol 21, p 22-25, January, 1983. 3 Fig, 4 Tab, 11 Ref.

Descriptors: *Aquatic weed control, *Sago pondweed, *Herbicides, Pesticides, Aquatic weeds, Aquatic plants, Pesticide toxicity, Macrophytes, Plant growth, Halogenated pesticides.

The minimum sustained concentrations of controlled release (CR) formulation of 2,4-dichlorophenoxy acetic acid (2,4-D) required to control the growth of Eurasian watermilfoil and Sago pondweed was determined in specially designed dilution tests. Five dilutions of 2,4-D (0.00, 0.03, 0.05, 0.10, and 0.25 milligrams/liter) were delivered to five sets of four test aquaria containing meristematic cuttings of Eurasian watermilfoil and germinated tubers of Sago pondweed growing in beakers of standardized peat:sand mixtures. Plant injury was assessed by growth and biomass measurements recorded periodically during 11 weeks of continuous exposure to the various 2,4-D concentrations. Results indicated that the 2,4-D threshold concentrations needed to control Eurasian watermilfoil and Sago pondweed were between 0.10 to 0.25 milligrams/liter, respectively. (Geiger-FRC)
W83-03163

AQUATIC PLANT CONTROL AND DISAPPEARANCE OF TERBUTRYN FROM TREATED WATERS IN ONTARIO, CANADA, 1974-1977,
Ontario Ministry of the Environment, Toronto.
D. Mackenzie, R. Frank, and G. J. Sirons.
Journal of Aquatic Plant Management, Vol 21, p 11-16, January, 1983. 7 Tab, 5 Ref.

Descriptors: *Herbicides, *Aauatic weed control, *Water pollution effects, *Pesticide residues, *Fate of pollutants, Aquatic plants, Lake sediments, Aquatic weeds, Algal control, Dissolved oxygen, *Ontario.

Between 1974 and 1978, 13 ponds and 12 lake plots were treated with terbutryn for the control of a wide variety of aquatic plants. Analyses of water and sediment samples showed that about half of the applied herbicide remained in the water column while half was deposited in the sediment. Where currents carried the herbicides out of the treated area, the terbutryn had little effect on aquatic plants. Control of aquatic plants was very good when water flow was interrupted for 10 days, but rotting plant material depleted oxygen levels, affecting some fish species. The best aquatic plant control occurred under static or nearly static water conditions. Terbutryn was most effective against filamentous algae, less effective against submersed vascular aquatic plants, and least effective against emerged aquatic plants. Low residues of terbutryn were identified in sediments 12 months after treatment. (Geiger-FRC)
W83-03166

FISHERIES PRODUCTIVITY AND WATER LEVEL FLUCTUATIONS IN LAC SEUL, NORTHWESTERN ONTARIO,
Hanna (J.E.) Associates, Inc., Mississauga (Ontario).
For primary bibliographic entry see Field 6G.
W83-03212

FIELD EVALUATION OF A WATER MANAGEMENT SIMULATION MODEL,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
R. W. Skaggs.
Transactions of the ASAE, Vol 25, No 3, p 666-674, May/June, 1982. 10 Fig, 7 Tab, 28 Ref.

Descriptors: *Water management, *Drainage, *Model studies, DRAINMOD, Simulation, Surface drainage, Subsurface drainage, Irrigation, Sprinkler irrigation, Subsurface irrigation.

Field studies are reported to test the reliability of the water management simulation model, DRAINMOD. The model was developed for design and evaluation of multicomponent water management systems which could include facilities for subsurface drainage, surface drainage, subirrigation and sprinkler irrigation. The model can be used to simulate the performance of a water management system design over a long period of climatological record. By evaluating several designs, the alternative system which satisfies the design objectives at the least cost can be identified. DRAINMOD is based on a water balance in the soil profile. It is composed of a number of separate components which evaluate the various mechanisms of soil water movement and storage. Three soil types and five different drainage system designs were included in the experiment from which 21 site-years of data were obtained. Rainfall intensity and water table elevations were compared to predicted values. Comparison of predicated and measured water table elevations were in excellent agreement with the daily water table depths having standard errors of estimate ranging from 7.5 to 19.6 cm. The average absolute deviation between predicted and observed water table depths for 21 site-years of data was only 8.1 cm. Based on these findings, DRAINMOD can be reliably used to predict the effect of drainage system design on water table elevations. (Baker-FRC)
W83-03238

INFLUENCE OF AGRICULTURAL DRAINAGE ON WATER QUALITY,
Delaware Univ., Newark. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W83-03289

URBAN FLOOD DAMAGE ESTIMATING CURVES,
Georgia Inst. of Tech., Atlanta.
For primary bibliographic entry see Field 2E.
W83-03294

WORTH OF INFLOW FORECAST FOR RESERVOIR OPERATION,
California Univ., Los Angeles. School of Engineering and Applied Science.
W. W. -G. Yeh, L. Becker, and R. Zettlemoyer.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 108, No WR3, p 257-269, October, 1982. 4 Fig, 6 Tab, 6 Ref. OWRT C-7099(6209).

Descriptors: *Reservoir operation, *Streamflow forecasting, *Benefits, Reservoir releases, Hydroelectric power, Water conservation, Beneficial uses, Flood control, Seepage control, Forecasting, Simulation analysis, Water storage, Pumped storage, Oroville-Thermalito Reservoir, *California.

Consideration of long-range (one month to one year) streamflow forecasts in the operation of Oroville-Thermalito Reservoir, California, a multipurpose reservoir with pumped storage, would produce several benefits: increased hydropower production, water conservation for irrigation and/or other beneficial uses, and decreased seepage damage to crops. Flood control benefits are potentially high, but can be attained using short-term predictions of several days. The reservoir was theoretically operated for the period 1914-73 with contractual requirements and agreements as absolute restraints, adjusting releases to enhance benefits as streamflow predictions allowed. On the average, releases were made during the first half of the month to conform with predicted monthly flow and during the second half in conformity with actual inflow to produce an end-of-the-month storage reflecting actual inflows and releases. Hydropower benefits were improved up to 3.56% using long-range forecasts and up to 6.48% using the historical mean streamflows. Releases were made according to streamflow prediction to leave storage space for potential spills. Benefits from releasing water for beneficial uses in June-September were increased 22-24% using the long-range forecast method and 22% using the historical mean. Seepage, which occurs at flows greater than 85,000 cfs, is most likely in April-June (snowmelt period). Simulation with current operation policies produced 13 seepage events during the 60 year period. Accurate prediction of spring streamflows during the previous winter could reduce high flow events to zero. Using either the method in this paper or the historical mean to determine reservoir releases prevented 7 of the seepage events. The risky nature of using historical means to predict streamflow and operate a reservoir was illustrated by the lower-than-observed storage levels simulated for the 1976-77 drought. (Cassar-FRC)
W83-03296

THE BIOLOGICAL REGULATION OF BLOOM-CAUSING BLUE-GREEN ALGAE: A FEASIBLE ALTERNATIVE,
Nebraska Univ., Lincoln. School of Life Sciences.
For primary bibliographic entry see Field 5C.
W83-03311

REAL-TIME FORECASTING OF RIVER FLOWS AND STOCHASTIC OPTIMAL CONTROL OF MULTIRESERVOIR SYSTEMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
P. K. Kitanidis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-221762, Price codes: A04 in paper copy, A01 in microfiche. Iowa State Water Resources Research Institute Completion Report No 133, Iowa State Univ., Ames, March 1983. 52 p, Fig 3, 47 Ref, 1 Append. OWRT A-083-IA(1), 14-34-0001-2117.

Descriptors: *Reservoirs, *Optimization, *Forecasting, Model studies, Stochastic processes, *Reservoir operation, *Risks, *Certainty equivalent, Control systems.

An examination was made of the interaction between stochastic forecasting and optimization in the real-time operation of reservoir systems. The problem of optimizing the expected value of a single-objective function representing the performance of a reservoir system with stochastic inflows is discussed. General approaches for its solution are reviewed and their limitations are discussed. In general, the problems of statistical forecasting and optimization are coupled and cannot be separated without loss of optimality. There are, however, particular classes of optimization problems, called certainty equivalent, for which the present optimal operation is indifferent to future uncertainty. For such systems it is appropriate to decouple stochastic estimation from control and use the best projections of real-time forecasting schemes in series with deterministic optimization. For known system and measurement dynamics, an operation problem is certainty equivalent if there is no need for 'caution' or hedging. From the viewpoint of applications the concept of caution is fundamental to the extent that optimization problems appearing in reservoir operation problems may be distinguished into certainty equivalent and caution-dominated. Discussion and examples are presented to provide some insight into the interaction between uncertainty in forecasting and optimization and the effect of this interaction on the selection of an appropriate method of solution.
W83-03323

FLOOD CONTROL EFFECTIVENESS OF SYSTEMS OF DUAL PURPOSE DETENTION BASINS,
New Jersey Dept. of Environmental Protection, Trenton.
W. Whipple, Jr, S. D. Faust, W. Renwick, and N. K. Wiegand.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-223032, Price codes: A03 in paper copy, A01 in microfiche. Center for Coastal and Environmental Studies Completion Report, Rutgers - The State Univ. of New Jersey, New Brunswick, January 1983. 33 p, 3 Fig, 9 Tab, 10 Ref. OWRT B-084-NJ(3), 14-34-0001-1246.

Descriptors: *Flood control, Sedimentation, *Urban runoff, Model studies, Biochemical oxygen demand, Design criteria, *Dual purpose detention basins, Water pollution control, Bacteria, Heavy metals, Suspended solids, phosphates, Hydrocarbons.

Modeling was conducted of the passage of 2-, 10-, and 100-year mean frequency floods through detention basins designed in accord with various design criteria. Basins included were those with the additional purpose of removing particulate pollution. Results showed that the requirement to retain particulate pollution adds little to the storage needed to prevent past development increases in flooding from various sizes of design criteria for flood control and for alleviation of channel erosion tendencies. One of the research objectives was to make a more definitive determination of the relationship between pollutant settleability of runoff as observed in the laboratory and in the actual basin. It was concluded from these laboratory and field studies that substantial quantities of BOD sub 5,20, suspended solids, total phosphates, total hydrocarbons, and six heavy metals are removed by simple sedimentation. Fecal coliforms and total organic carbon are not reduced significantly by plain sedimentation.
W83-03350

CURRENT STORMWATER DRAINAGE PRACTICE IN SOUTH AFRICA,
M. D. Watson, and L. C. Miles.
Civil Engineer in South Africa, Vol 24, No 6, p 251-253, 255-257, June, 1982. 6 Fig, 6 Tab, 14 Ref.

Descriptors: *Stormwater, *Design criteria, Water management, *Drainage, *Flood control, Engineering, Storm runoff, Rainfall-runoff relationships, Storms, *South Africa.

A survey of current stormwater drainage design practices by the National Building Research Institute was made during 1979. Questionnaires were sent to various design offices in the Republic of South Africa. Questions concerned design philosophy, design storm recurrence intervals, frequency of observed malfunctions, hydrological design methods, and minimum allowable pipe diameters. An example of a design for a hypothetical urban subdevelopment was also requested. The results indicated a common design philosophy throughout the country but highlighted wide variations in the application of design techniques. The traditional drainage design philosophy of disposing of runoff in the most rapid way available is the method most commonly applied. The more recent philosophy incorporating the concepts of minor and major systems, although not unknown, has not become common design practice. There are wide differences of opinion on the amount of flood protection needed for a given type of development. Designers are generally of the opinion that a drainage system performs as it is designed to perform. The Rational Method of flood prediction was the most commonly used technique for sizing stormwater drainage pipes. Computer methods are not commonly used for urban flood prediction, and modern stormwater drainage computer models are also used infrequently. Flood prediction should be based on a sound understanding of the rainfall-runoff process. The need for local runoff data is essential to further our knowledge and experience. (Baker-FRC)
W83-03387

A PUBLIC PARTICIPATION DECISION TO FILL A PACIFIC NORTHWEST RESERVOIR,
Army Engineer District, Portland, OR.
For primary bibliographic entry see Field 6D.
W83-03423

MANAGING FOR WAVES ON NEBRASKA'S LAKE MCCONAUGHY - AN OVERVIEW,
Nebraska Water Resources Center, Lincoln.
For primary bibliographic entry see Field 8A.
W83-03426

INVESTIGATION INTO EFFECTIVE CONTROL METHODS FOR BRAZILIAN ELODEA (EGERIA DENSA PLANCHON) IN LAKE MARION, S.C.,
Clemson Univ., SC. Dept. of Botany.
C. R. Dillon, and K. D. Getsinger.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-224477, Price codes: A05 in paper copy, A01 in microfiche. Water Resources Research Institute Publication No 103, Clemson Univ., S.C., May 1983. 85 p, 7 Fig, 7 Tab, 18 Ref, 1 Append. OWWR B-124-SC(1), 14-34-0001-9132.

Descriptors: Aquatic plants, *Aquatic weed control, *Biomass, *Brazilian elodea, *Carbohydrates, Carbon, *Carbon radioisotopes, *Egeria densa, *Starch benthic flora, Lake Marion, Life history studies, Plant populations, Population dynamics, Rooted aquatic plants, Submerged plants, Weed control, Weeds, *South Carolina.

Biomass production, morphological and physiological phenomena were followed in various plant parts to determine periods of quiescence, growth and senescence in the life cycle of Egeria densa Planchon (Brazilian elodea) in Lake Marion, South Carolina, from March, 1980 to May, 1981. Physicochmical parameters were also measured during 1978 to 1979. Major growth flushes occurred in spring and fall. Each of these flushes were followed by periods of senescence, denoted by decline in physiological activity and loss of biomass through sloughing and decay of tips and branches. A period of quiescence was observed in winter, denoted by limited physiological activity and no loss of biomass. Maximum biomass occurred in July. Minimum biomass occurred in March. Late summer-early fall senescence occurred during periods of elevated water temperatures. Greatest super 14C assimilation occurred from April through July, and least assimilation occurred in August and January. Amylase activity was greatest in most plant parts during spring, decreased in summer and increased again in fall. Greatest levels of amylase activity occurred in stems and rootcrowns. Starch concentration was inversely proportional to amylase activity, with the highest starch levels occurring in summer and the lowest occurring in winter and early spring. Greatest starch concentrations were found in stems and rootcrowns.
W83-03433

4B. Groundwater Management

INVESTIGATIVE PROGRAMS FOR DESIGNING AND MODELING MINE WATER CONTROL SYSTEMS,
International Engineering Co., Inc., San Francisco, CA.
L. C. Venburg, D. Sokol, and M. V. Damm.
Mining Engineering, Vol 34, No 8, p 1217-1219, August, 1982. 6 Fig, 3 Ref.

Descriptors: *Mine drainage, Model studies, *Dewatering, *Groundwater management, *Hydrologic models, *Aquifer management, *Mining engineering, Groundwater movement, Injection wells, Recharge wells, Aquifer characteristics, Water management.

The uses of models predicting groundwater inflow and the impact of dewatering and stream diversion are described. Geohydrologists and engineers use various models to optimize handling of surface and groundwater during mining operations. In addition, the initial and long-term impacts of mining and dewatering can also be predicted by modeling. Models should be based on extensive and cumulative hydrologic and geologic data on the site in question and similar mining areas. Ideally, these data should cover aquifer properties and conditions (confined, semiconfined or unconfined), potentiometric surface or water table information, aquifer recharge, groundwater movement, natural discharge and water quality data. A conceptual groundwater model which incorporates these factors was constructed for a mine between two tributary streams. The model includes the hydrologic boundary conditions based on a field investigation program. The edge modes of the model are set as no-flow, constant flux or constant head boundaries, depending on recharge conditions. Such a model should be useful in designing the water control system and determining the impact on the hydraulic regime. (Geiger-FRC)
W83-03265

AN ASSESSMENT OF THE USE POTENTIAL OF THE FLOW OF WATER AT THE SPRING 'OJO DE AGUA' IN AGUADILLA, PUERTO RICO,
Puerto Rico Univ., Mayaguez. Dept. of General Engineering.
N. Aneses, and A. Calderon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-221747. Price codes: A03 in paper copy, A01 in microfiche. Puerto Rico Water Resources Research Institute completion report, Mayaguez, June 1983. 29 p, 1 Append. OWRT A-072-PR(1). 14-34-0001-1141.

Descriptors: *Hydroelectric power, *Springs, Flow, *Puerto Rico, Aquadilla.

The objective of this study was to determine the potential uses which could be given to the water emerging from a small spring located within the urban zone of the town of Aguadilla, in Puerto Rico. It was found that the spring produces 766 gallons per minute during the island's dry season and 1,324 gallons per minute during the rainy season. The minimum amount of electricity which could be generated from the spring was determined to be 283 watts if a mini-hydroelectric plant were placed in it. This would be enough to provide adequate illumination for a passive-recreation park located next to the spring. (R. Munoz)
W83-03321

MONITORING OF GROUNDWATER LEVELS FOR REAL-TIME CONJUNCTIVE WATER MANAGEMENT,
Arkansas Univ., Fayetteville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 7B.
W83-03333

EVALUATION AND ACCESSING OF DATA FOR A WATER RESOURCES SIMULATOR,
Arkansas Univ., Fayetteville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 7A.
W83-03334

EFFECTS OF GROUNDWATER PUMPAGE ON SURFACE AND GROUNDWATER FLOWS ON ADJOINING BASINS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
E. S. Simpson, U. Kafri, and J. H. Randall.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-224451, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Center Completion Report, Tucson, Arizona, June 1983. 40 p, 14 Fig, 9 Tab, 30 Ref. OWRT A-070-ARIZ(1). 14-34-0001-6003.

Descriptors: Groundwater, *Groundwater depletion, *Arizona, Cienega Basin, *Groundwater recharge, *Aquifer models, *Withdrawals, Model studies.

The consequences were examined of possible future large-scale groundwater withdrawals from Cienega Basin, located about 40 miles southeast of Tucson, Az. The basin lowland consists of alluvial deposits up to 2,000 feet thick, surrounded by fractured rocks that rise to more than 5,000 feet above the lowland. Total drainage area is 303 mi super 2. Average annual ppt. is 17 in. Average annual recharge to groundwater calculated by an infiltration method is 19,500 acre-feet; calculated by a salt balance method it is about 15,700 acre-feet calculated by model calibration it is about 10,700 acre-feet. Model studies show that if future pumpage is 14,000 acre-feet/year, and assuming a storage coeff. of 0.01, at the end of 20 years the cone of depression will affect virtually the entire basin and encroach on adjoining basins. If the storage coeff. is assumed to be 0.10, the cone of depression will be confined to the lowland areas. Long-term value of the storage coeff. is believed to be equal to or greater than 0.10.
W83-03431

AN ECONOMIC ANALYSIS OF OBSTACLES TO WATER CONSERVATION IN MONTANA WATER LAW,
Montana State Univ., Bozeman. Dept. of Agricultural Economics and Economics.
R. Stroup, and A. Vinnard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-226845, Price codes: A04 in paper copy, A01 in microfiche. Montana Water Resources Research Report No 131, Montana State Univ., Bozeman, June 1983. 42 p, 4 Tab, 9 Fig, 6 Ref. OWRT A-130-MONT(1), 14-34-0001-1128.

Descriptors: *Groundwater resources, *Artesian aquifers, *Cost analysis, Linear programming, Dynamic programming, Pumping, Energy, Water law, Water conservation, Groundwater management, Groundwater policy, Land productivity, Sensitivity analysis, True costs, Temporal allocations, *Montana, Crow Creek.

This study examines groundwater management in Montana. State groundwater law is reviewed and various management approaches are briefly evaluated. A case study using linear and dynamic programming is made of the Crow Creek Valley in Southwestern Montana to demonstrate the use of an optimization model in determining the most efficient temporal allocation of groundwater. Results of the analysis indicate that when groundwater systems are confined, there is a decided economic advantage in maintaining the artesian

pressure in the system by not exploiting the stock component of the resource. Marginal pumping costs rise rapidly when groundwater is extracted from a confined system. If stocks are depleted to the point where the piezometric surface falls below the confining stratum, the system becomes unconfined and the artesian pressure is lost. If stocks continue to be depleted beyond this level, eventually the system moves to a second equilibrium state. Sensitivity analysis is used to examine the impact of changes in the discount rate, size of the basin, energy costs, and land productivity on the derived decision rule. Energy costs have the greatest impact on the general structure of the optimal use policy. The results of the case study point out the benefits from an optimal groundwater policy. Recommendations are made for further study.
W83-03464

CALIFORNIA GROUNDWATER MANAGEMENT: THE SACRED AND THE PROFANE,
John Muir Inst., Berkeley, CA. Center for National Resource Studies.
For primary bibliographic entry see Field 6E.
W83-03498

4C. Effects On Water Of Man's Non-Water Activities

ASSESSMENT OF STORMFLOW AND WATER QUALITY FROM UNDISTURBED AND SITE PREPARED FOREST LAND IN EAST TEXAS,
Texas A and M Univ., College Station. Water Resources Inst.
M. G. DeHaven, W. H. Blackburn, J. L. Nieber, W. W. Crawley, and A. T. Weichert.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-219816, Price codes: A07 in paper copy, A01 in microfiche. Completion Report No 122, January 1983. 125 p, 46 Tab, 40 Ref, 2 Append. OWRT A-049-TEX(1), 14-34-0001-0146,1146,2146.

Descriptors: Sediments, Nutrients, Nonpoint pollution sources, *Forest practices, Water quality, Watersheds, Biomass, Clearcutting, Shearing, Windrowing, *Texas, Stormflow, *Forest watersheds, Lumbering.

Nine small forested watersheds were instrumented in 1979 to determine the effect of intensive forest management practices on water quantity and quality. During 1981, the first year after treatment, stormflow volumes, sediment and nutrient losses increased with the intensity of the site disturbance. Sites sheared produced the greatest amount of stormflow, sediment and nitrate losses, followed by chopped and the undisturbed watersheds. Stormflow volumes, sediment and nitrate decreased on the sheared and chopped watersheds substantially the second year following treatment. The rapid vegetation and reduction in exposed mineral soil that occured on both sheared and chopped treatments during 1982, resulted in a decrease in runoff and sediment and nutrient losses. Limiting shearing and windrowing activities to the more gentle slopes will reduce first year erosion and prevent increases in sediment and nutrient losses. Roller chopping on the other hand, appears to cause only minor changes to water yield and quality on slopes of up to 25%.
W83-03277

4D. Watershed Protection

SOIL CONSERVATION AND WATER QUALITY IMPROVEMENT: WHAT FARMERS THINK,
Georgia Univ., Athens. Dept. of Agricultural Economics.
L. A. Christensen, and P. E. Norris.
Journal of Soil and Water Conservation, Vol 38, No 1, p 15-20, January-February, 1983. 40 Ref.

Descriptors: *Soil conservation, *Water quality, *Farming, Public opinion, Government supports, Erosion control, Soil erosion.

A review is offered of farmers' attitudes about the control of nonpoint pollution through soil conservation and other measures. While generally believing that soil erosion and water quality degradation are problems, farmers hesitate to admit that there is any relationship between their land and the national erosion problem. Farmers may be hesitant to recognize the problems and install conservation practices because of limited knowledge. The perceived effectiveness of a conservation practice will greatly influence a farmer's choice of a practice once he decides to implement a conservation program. Differing perceptions of the effectiveness of the conservation practices can be attributed to variations in both information about and experience with the practice. Perceptions of risks related to yields and income levels also influence a farmer's decision. Perceptions of benefits may also prevent farmers from initiating conservation programs. Apparently there is some question about the profitability of using conservation practices. Attitudes toward government involvement, personal characteristics, institutional characteristics, physical characteristics, and policy implications each in their own way influence the farmer's acceptance of soil conservation measures. (Baker-FRC)
W83-03161

EFFECTS OF INCREASED PRECIPITATION AND GRAZING MANAGEMENT ON NORTHEASTERN MONTANA RANGELANDS,
Geological Survey, Denver, CO. Water Resources Div.
F. A. Branson, and R. F. Miller.
Journal of Range Management, Vol 34, No 1, p 3-10, January, 1981. 7 Fig, 2 Tab, 29 Ref.

Descriptors: *Precipitation, *Land management, *Range management, Farm management, Vegetation, Watersheds, Moisture availability, Vegetation establishment, *Montana.

Fifteen plant communities on public lands in the Willow Creek basin near Glasgow, Montana were sampled in 1960 and again in 1977 to determine possible vegetation changes, Most of the communties demonstrated remarkable improvement in ground cover and forage production. Factors which contributed to these changes included: higher precipitation during the period between the first and second sampling than had been noted during the 10 year period prior to the first samples, and improved management practices such as land treatments and application of rest-rotation grazing systems. These finding conflict with the generally held opinion that the western rangelands are deteriorating. (Baker-FRC)
W83-03174

WATER QUALITY TRANSMISSION AND RUNOFF FROM EASILY CRUSTED ERODABLE SOILS AND MINE SPOILS. EFFECTS OF IN-SITU CROSSLINKABLE OIL TREATMENTS,
North Dakota State Univ., Fargo. Dept. of Chemistry.
P. Pappas, and J. Richardson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-219733, Price codes: A08 in paper copy, A01 in microfiche. North Dakota Water Resources Research Institute Completion Report, North Dakota State University, Fargo, January 1983. 147 p, 31 Fig, 18 Tab, 130 Ref. OWRT B-056-NDAK(1), Matching Grant.

Descriptors: *Polymers, *Soil stabilization, Soil physical properties, Soil chemical properties, Soil structure, Soil texture, Erosion control, Chemical properties, Chemical reactions, *Soil treatment, Water quality, Runoff, Polyvinyl alcohol, Organic matter, Mine spoils.

Part I: A variety of two-phase, cross-linking polymers were tested and compared to polyvinyl alcohol as a treatment for soils. From these tests knowledge which cross-linking polymers have the greatest potential for use and the kinds or organic functional groups which promote aggregation most effectively. It was found that the traditional aggregate assessment methods yield little information about the bonding mechanisms that were occurring. Part II: Bonding mechanisms and mineral surface bonding strength were examined in order to obtain an understanding which would allow for development of better polymer types. The cross link polymers were synthesized from aldehyde and amine monomers. Existing literature suggests that amine should be added first to the soil and then the aldehyde added later to create the crosslinked in situ polymer. However, the rapid rise in soil pH that occurs when amines are added first creates organic matter destabilizaton. Therefore, aldehydes should bind first with the soil and the amines be added later for in situ cross-linking. The project has produced several new polymer materials. The in situ cross-linking polymers were not effective as amendments in these tests but the important functional groups have been identified and more effective polymers can be created in the future.
W83-03269

ASSESSMENT OF STORMFLOW AND WATER QUALITY FROM UNDISTURBED AND SITE PREPARED FOREST LAND IN EAST TEXAS,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 4C.
W83-03277

CONSERVATION OF SOIL, WATER, ANDD ENERGY THROUGH REDUCED TILLAGE SYSTEMS - PHASE I SUB 1,
Nebraska Univ.-Lincoln. Dept. of Agricultural Engineering.
E. C. Dickey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220012, Price codes: A05 in paper copy, A01 in microfiche. Nebraska Water Resources Center Completion Report, Univ. of Nebraska, Lincoln, June 1983. 65 p, 11 Fig, 26 Tab, 31 Ref. OWRT B-052-NEB(1), 14-34-0001-0229.

Descriptors: *Soil erosion, *Soil conservation, *Erosion control, *Cultivation, Sedimentation, Soil management, Runoff, Precipitation, Mulching, *Nebraska, *Tillage systems, Simulated rainfall.

Soil erosion and sedimentation have been identified as major water quality problems in Nebraska. This project was initiated in 1980 to evaluate and demonstrate the influence of selected tillage systems on soil erosion, water runoff, nutrient loss, crop yield, fuel and energy use, and labor inputs. Tillage plots were established at two sites having different soil types and field slopes. Simulated rainfall, applied at the rate of 2.5 inches per hour, showed that soil erosion increased as the amount of residue remaining on the soil surface decreased. No-till planting, which left the highest percentage of soil surface covered with residue, resulted in the least amount of erosion, whereas the moldboard plow system has the most erosion. As little as a 20% residue cover reduced erosion by 50 percent of that which occurred from cleanly tilled, residue free soil conditions. Reducing or eliminationg field operations also decreased fuel use and labor requirements for tillage and planting. No-till had fuel and labor requirements 75 and 50 % lower, respectively, than the moldboard plow system. When cultural energy inputs were considered, no-till still used 10 % less total energy than the moldboard plow system, even though pesticide use was higher with no-till. Simulated rainfall was effective for demonstrating differences in erosion from various tillage systems.
W83-03287

THE COSTS AND BENEFITS OF SOIL EROSION CONTROL IN THE NORTH LAKE CHICOT WATERSHED,
Arkansas Univ., Fayetteville. Dept. of Agricultural Economics and Rural Sociology.
R. N. Shulstad, C. T. Osborn, and A. D. McQueen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222208, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Center Publication No 95, Univ. of Arkansas, Fayetteville, March 1983. 49 p, 1 Fig, 4 Tab, 8 Ref. OWRT A-056-ARK(2), 14-34-0001-2104

Group 4D—Watershed Protection

Descriptors: *Arkansas, *Soil erosion, *Watershed management, Farm management, *Soil conservation, *Lake basins, Surface water, *Economic feasibility, *Cost-benefit analysis, *Recreation demand, Lake Chicot.

Lake Chicot is divided by a levee into two basins, the high quality northern basin and the extremely polluted southern basin. Water quality in the northern basin of Lake Chicot is diminishing due to soil erosion. Costs for alternative control programs for the seventeen farm, 11,470 acre northern watershed were estimated. Twenty-nine combinations of rotations and best management practices were evaluated. Soil loss can be reduced almost 25% from 4.2 tons per acre to 3.2 tons per acre, while increasing net returns to farmers from $83.94 per acre to $107.28 per acre by altering present cropping patterns. A prohibition on fall plowing would result in an average net return of $106.28 per acre and reduce average soil loss to 2.9 tons per acre. An average soil loss restriction would be the most cost-effective policy, exclusive of administrative costs. Benefits of erosion control were estimated by the difference between the value of recreational participation on the northern basin and the value for the southern basin. Controls programs were highly cost-effective.
W83-03331

LARGE ORGANIC DEBRIS AND ANADROMOUS FISH HABITAT IN THE COASTAL REDWOOD ENVIRONMENT: THE HYDROLOGIC SYSTEM,
California Univ., Santa Barbara. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2E.
W83-03335

SOIL CONSERVATION AND THE REDUCTION OF EROSION AND SEDIMENTATION IN THE COON CREEK BASIN, WISCONSIN,
Geological Survey, Columbus, OH. Water Resources Div.
S. W. Trimble, and S. W. Lund.
Available from Br. of Distr., USGS, 604 S. Pickett St., Alexandria, VA 22304, Price $2.75. Geological Survey Professional Paper 1234, 1982. 35 p, 22 Fig, 7 Tab, 44 Ref, 3 Append.

Descriptors: Soil conservation, *Soil erosion, *Land management, *Sedimentation, Deposition, Sheet erosion, Rill erosion, Land use, *Wisconsin, Coon Creek basin, Driftless area.

The Coon Creek basin, in the Driftless Area of Wisconsin, has been strikingly transformed by soil conservation measures since the 1930's. Comparison of sheet and rill erosion by use of the Universal Soil Loss Equation, shows 1975 erosion rates on upland fields to be about one-fourth those of 1934. Average annual sedimentation accumulation in small reservoirs declined from about 5,000 megagrams per square kilometer in 1936-45 to about 50 megagrams per square kilometer in 1962-75. Analysis of deposition in tributary valleys suggests that annual rates declined from about 3,700 megagrams per square kilometer in the 1930's to about 35-70 megagrams per square kilometer in recent years. These reductions in erosion and sedimentation are due principally to improvements in land management and, to a lesser degree, to changes in land use. (USGS)
W83-03356

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

IMPROVED SALMONELLA RECOVERY FROM MODERATE TO HIGHLY POLLUTED WATERS,
Valencia Univ. (Spain). Dept. of Microbiology.
E. Alcaide, J. P. Martinez, P. Martinez-Germes, and E. Garay.
Journal of Applied Bacteriology, Vol 53, No 2, p 143-146, October, 1982. 4 Tab, 21 Ref.

Descriptors: *Pollutant identification, *Salmonella, *Separation techniques, *Culturing techniques, *Culture media, Enteric bacteria, Enrichment, Antibiotics, Sewage bacteria, Pathogenic bacteria.

A new enrichment procedure for the recovery of Salmonella from aquatic environments is described. The new method consists of adding sodium novobiocin to a modified Rappaport's medium (NR10/43 degrees). The new Salmonella enrichment procedure was tested on water samples from a eutrophic lake (Albufera Lake, near Valencia, Spain) with moderate to high levels of fecal contamination and on samples of effluent entering a wastewater treatment plant. Statistical analysis of variance was used to compare the present method with other enrichment procedures. Results showed that the new medium offered a better recovery of Salmonella from water than selenite broth enrichment procedures and a simplification of the overall procedure. (Geiger-FRC)
W83-03164

DEUTERIUM AS A TRACER IN THE GROUNDWATER STUDY OF A CENTRAL NORTH DAKOTA MINING AREA,
North Dakota State Univ., Fargo. Dept. of Chemistry.
W-J. Hwang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-212019, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Institute Completion Report, North Dakota State University, Fargo, January 1983. 68 p, 14 Fig, 1 Tab, 43 Ref, 8 Append. OWRT A-075NDAK(1), 14-34-0001-2136.

Descriptors: *Groundwater, *Deuterium, *Mass spectrometry, *Strip mines, Infiltration, Precipitation, Surface water, Surface-groundwater interaction, Analytical methods, *North Dakota, Pollutant identification.

As part of a joint project designed to evaluate the impact of surface mining and reclamation on groundwater and surface water quality and quantity, the hydrogen isotope contents of water samples from two central North Dakota study areas have been analysed using mass spectrometric method. Five microliters of water samples were quantitatively converted into hydrogen gas. They were then analyzed with a double-inlet Nuclide mass spectrometer. Precipitations in the study area had deuterium content ranging from -17% for a rain sample, to -206% for a snow sample. Surface water samples had a mean deuterium content of about -80% with apparent seasonal variation and evaporative effect. Groundwater samples taken from undisturbed area (Falkirk area) had a mean deuterium content of about -120%, showing little evaporation or seasonal variations. From the deuterium data as well as oxygen-18 data, the groundwater sample taken seems to be recharged from local precipitation. Part of the groundwater samples taken from Center Mine area (disturbed setting) showed evaporative effects, which might be related to the exposure to atmosphere as a result of mining. Samples taken near or inside waste disposal sites also showed distinctive deviation from meteroic water line.
W83-03177

DETERMINATION OF THE COMPLEXING CAPACITY OF WATER SYSTEMS BY GEL CHROMATOGRAPHIC AND ELECTROCHEMICAL TECHNIQUES,
North Dakota Univ., Grand Forks. Dept. of Chemistry.
D. E. Bartak.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-214957, Price codes: A03 in paper copy, A01 in microfiche. North Dakota Water Resources Research Institute Completion Report, North Dakota State University, Fargo, January 1983. 41 p, 10 Fig, 41 Ref. OWRT B-057-NDAK(1).

Descriptors: *Reticulated vitreous carbon electrode, *Metal complex separation, Modified gel permeation chromatography, *Electrochemical flow cell, *Chromatography, Copper complexes, Water analysis, Trace metals, Pollutant identification, Organic acids, EDTA, Polyamiocarboxylic acid, Ligands.

Part I: An electrochemical flow cell has been developed using reticulated vitreous carbon (RVC) coated with a thin film of mercury. The flow cell and electrode components are inexpensive and easily constructed. Reproducible results have been obtained for centrations as low as 100 ppb. Peak currents were dependent on flow rate, electrode size, and mercury deposition time. Oxygen interference was reduced by nitrogen purging to enable analysis of sub-ppm metal concentrations. The cell was tested as a detector for metal complexes eluated from a modified gel permeation chromatographic column. Part II: A modified gel permeation chromatographic technique using eluent which is buffered with copper(II) is used to separate a series of copper(II) complexes. An electrochemical flow cell is used to identify and quantitate the copper complexes; a reverse pulse amperometry mode is used to minimize oxygen interferences. A Sephadex G-25 column is used to resolve a mixture of polyaminocarboxylic acids. The detection limit for EDTA which is quantitified as the Cu-EDTA complex is found to be 12 microgram. A series of amino acids and organic carboxylic acids are tested with the above techniques. All of the above ligands except tyrosine are separated via size exclusion with a common depleted metal trough in the chromatographs.
W83-03185

MOLECULAR SIZE DETERMINATION OF CHLOROFORM PRECURSORS,
Iowa Univ., Iowa City. Dept. of Civil and Environmental Engineering.
J. L. Schnoor.
Iowa State Water Resources Research Institute, Publication No 109, Iowa State University, Ames, January 1983. 45 p, 1 Append. OWRT A-072-IA(2), 14-34-0001-0117.

Descriptors: *Organic compounds, River, Chlorination, Chemical composition, *Water treatment, Design criteria, *Molecular weight, *Trihalomethanes, *Organic carbon, *Chromatography, *Pollutant identification, Gel permeation chromatography, Iowa River, *Iowa.

The trihalomethane (THM) yield on a total organic carbon (TOC) basis was measured as a function of the molecular weight of precursor organics in the Iowa River. Gel permeation chromatography with Sephadex G-75 gel was utilized to separate naturally occurring organics into apparent molecular weight fractions that were subsequently chlorinated to 2 mg/L of free residual and analyzed for THMs. Ninety percent of the organics in the Iowa River were of mol wt less than 3000, while 75% of the THMs were derived from the mol wt less than 3000 fraction. Precursor organics were greatest during the months May-August. A packed-bed, countercurrent stripping tower was utilized to remove THM and other volatile organics from water. Design equations were developed.
W83-03187

FLUORIMETRIC DETERMINATION OF CHLOROFORM IN DRINKING WATER,
Kyoto Univ. (Japan). Faculty of Pharmaceutical Sciences.
K. Okumura, K. Kawada, and T. Uno.
Analyst Vol 43, No 6, p 1498-1502, 1982. 4 Fig, 5 Tab, 6 Ref.

Descriptors: *Water analysis, *Chloroform, *Fluorometry, Drinking water, Potable water, Trihalomethanes, Water quality, *Pollutant identification.

Chloroform gives a blue fluorphore when heated with nicotinamide and concentrated sodium hydroxide solution. This has been used to develop a new method which enables chlorform to be determined in water at the nanogram per milliliter level.

The blue fluorescence has an excitation maximum at 372 nm and an emission maximum at 467 nm. A linear relation was obtained between the concentration of chloroform and fluorescence intensity. The slopes of the calibration lines are dependent on the concentration of nicotinamide. The solution containing 20% m/v nicotinamide gave the maximum slope, that is, the maximum sensitivity to chloroform. The heating time of 3.0 minutes, which gives maximum and stable fluorescence intensity, was adopted for the present study. The average recovery of chloroform from water was excellent. This method is specific to trihalomethanes and is insensitive to other polyhalogen compounds. Sodium thiosulfate, added to remove residual chlorine from water samples, did not interfere in the determination of chloroform. (Baker-FRC)
W83-03190

DETERMINATION OF TOTAL IODINE AND IODATE-IODINE IN NATURAL FRESHWATER,
Institute of Hydrology, Wallingford (England).
S. D. Jones, C. P. Spencer, and V. W. Truesdale.
Analyst, Vol 43, No 6, p 1417-1424, 1982. 2 Fig, 2 Tab, 5 Ref.

Descriptors: *Iodine, Surface waters, *Water analysis, Iodate-iodine, Catalysts, Catalytic method, Pollutant identification.

The procedures for the determination of iodate, iodide and total iodine at concentrations between 0 and 5 micrograms/liter in freshwater are described. The procedures rely on the catalytic determination of iodide using the reaction between ammonium cerium(IV) sulfate and arsenious acid. Whereas total iodine is determined directly by a modification of an earlier procedure, iodate is determined after solvent extraction of iodide-iodine as an ion pair with the tetraphenylarsonium cation. It is also demonstrated that a catalytic method can be rigorously modified so as to satisfy new requirements. The analysis of sets of 11 replicate samples showed that the total iodine concentration could be resolved to within 0.1 microgram/liter at the 95% confidence level. The effect on the methods of various substances that could be present in the freshwaters is described, together with tests conducted upon some organic iodine compounds. The unsuspected presence of organic compounds would create problems. Analysis for total iodine can be conducted at the rate of about 50 samples per hour and that for iodate-iodine at about 20 per hour. (Baker-FRC)
W83-03206

ACCURACY OF DETERMINATION OF TOTAL OXIDISED NITROGEN AND NITRITE IN RIVER WATERS: ANALYTICAL QUALITY CONTROL IN THE HARMONISED MONITORING SCHEME.
Water Research Centre, Marlow (England).
Analyst, Vol 43, No 6, p 1407-1416, 1982. 7 Tab, 7 Ref.

Descriptors: *Water analysis, *Nitrogen, *Quality control, Nitrates, Rivers, Laboratories, Research facilities, *Nitrites, *Pollutant identification.

A collaborative study was performed on the determination of total oxidized nitrogen and nitrite in river waters. Each of the 11 participating laboratories achieved total errors of not greater than 20% of the determined concentration or 0.1 mg/1 of nitrogen (whichever was the larger for different sample concentrations). The success of the work was attributed to the suitability of the analytical methods adopted by the laboratories and the sequential approach followed in the analytical quality control program. The latter involves a relatively large amount of work in each of the participating laboratories, and a relatively long period is needed to complete all tests. However, these very factors provide many opportunities for unsuspected errors to reveal themselves, thereby facilitating recognition and elimination of problems so that a permanently sound basis is established for routine achievement of the required accuracy. Since most laboratories used modifications of the same analytical procedure (the Griess-Ilosvay spectrophotometric technique) the interlaboratory bias tests do not provide a direct check on absolute bias in river samples, merely on bias with respect to the mean result of many laboratories. Where laboratories use analytical methods based on different principles there is less likelihood of systematic errors caused by the choice of a single analytical method. In this case the mean result of many laboratories is more likely to correspond closely with the true value of determined concentration, and hence the inter-laboratory bias tests will provide a measure of absolute bias. (Baker-FRC)
W83-03207

EFFECT OF SUNLIGHT ON ENUMERATION OF INDICATOR BACTERIA UNDER FIELD CONDITIONS,
Hawaii Univ. at Manoa, Honolulu. Water Resources Research Center.
R. S. Fujioka, and O. T. Narikawa.
Applied and Environmental Microbiology, Vol. 44, No 2, p 395-401, August, 1982. 2 Fig, 1 Tab, 16 R. OWRT A-053-HI.

Descriptors: *Bacterial analysis, *Sample preservation, *Radiation, *Pollutant identification, Water analysis, Wastewater analysis, Coliforms, Streptococci, Sampling, Bactericides, Microbiological studies, *Bioindicators.

The bactericidal effect of sunlight on subsequent enumeration of fecal coliforms (FC) and fecal streptococci (FS) was studied using samples and sunlight conditions in Hawaii. Samples were raw sewage and raw sewage diluted (1:100) with seawater or clear stream water. Sample containers were made of clear glass or translucent polyethylene. These were exposed to strong sunlight or totally shielded from sunlight for 5, 10, 15, 20, 30, 60, and 120 min before assay by the standard membrane filtration method. Bacteria in raw sewage samples were not greatly affected by sunlight. However, in diluted samples the 90% inactivation times were: FC in sewage-seawater mixture, 13 min in glass and 17 min in polyethylene; FS in sewage-seawater mixture, 26 min in glass and 32 min in polyethylene; FC in sewage-streamwater mixture, 28 min in glass and 38 min in polyethylene; and FS in sewage-streamwater mixture, > 120 min. Bacteria in samples filtered through a membrane were placed in petri dishes with growth media and exposed to sunlight for 5-30 min. FC concentrations were reduced by 99% after 10 min sunlight exposures, 99.9% after 15 min, and 100% after 20 min. These results were the same for undiluted and diluted samples. Neither cooling the agar in ice nor condensation of water vapor in the petri dishes inhibited the bactericidal action of sunlight. It is recommended that water and sewage samples be collected in dark brown containers and shielded from sunlight until sample enumeration. (Cassar-FRC)
W83-03291

NEW APPROACHES TO MEASURING TOTAL BACTERIAL POPULATIONS IN WATER SUPPLIES,
Delaware Univ., Newark. School of Life and Health Sciences.
D. S. Herson, and K. H. Baker.
Journal of the American Water Works Association, Vol 74, No 10, p 537-539, October, 1982. 1 Fig, 3 Tab, 25 Ref. OWRT A-028-DEL.

Descriptors: *Bacteria, *Water analysis, *Microbiology, *Pollutant identification, Bacterial analysis, Microbiological studies, Drinking water, Well water, *Delaware, Wilmington, Newark, *Water treatment.

Direct counts of stained bacterial cells were compared with standard plate counts in samples from a distribution system and private unchlorinated wells. The technique, AOINT, combined acridine orange (AO) staining with 2-(p-iodophenyl)-3-(p-nitrophenyl)-5-phenyl tetrazolium chloride (INT) reduction. A gel stripping procedure was used to transfer the cells from the membrane filter to a gelatin matrix because the filter pores interfered with recognition of INT-formazan crystals. Plate count agar results and AOINT results were not significantly correlated. AOINT results were significantly higher than the standard plate count results. In well water samples, plate counts were 12-4800 CFU per ml; AOINT, 8000-55,000 cells per ml. In distribution water samples plate counts were 0-566 CFU per ml; AOINT, 300-10,000 cells per ml. The AOINT technique requires only 4 hours for determination. However, it identifies only the number of metabolically active bacteria, not the type. It is suggested as an adjunct to, not a replacement for, the standard plate count. (Cassar-FRC)
W83-03292

DEVELOPMENT OF A CELL CULTURE SCREEN FOR WATER TOXICITY,
Oklahoma State Univ., Stillwater. Dept. of Biochemistry.
F. R. Leach, S. R. VanDoren, L. B. Frazier, and M. S. Hall.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220533, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Institute Completion Report, Oklahoma State Univ., Stillwater, March, 1983. 25 p, 2 Fig, 4 Tab, 4 Tab, 15 Ref, 2 Append. OWRT A-097-OKLA(1), 14-34-0001-1138.

Descriptors: *Bioassay, *Biochemical tests, *Metabolism, Pollutants, Water pollution, Oil refineries, *Oil pollution, Organic compounds, Inhibitors, Organic solvents, Radioactive tracers, Radioisotopes, Inorganic compounds, Acid streams, Mine drainage, *Toxicity tests, Pollutant identification, *Oklahoma, Tar Creek.

A technique for the rapid measurement of the toxicity of water samples to cells in culture has been developed. HeLa cells growing on microcarrier beads were incubated with 0.1 micro-Ci/ml of (super 3H)-thymidine and appropriate dilutions of the water sample in question. The beads with the attached cells were sedimented by centrifugation and treated with 10% trichloroacetic acid to precipitate DNA. The precipitate was dissolved by incubating with Soluene 350. The radioactivity in the samples was determined with a liquid scintillation counter and the percent inhibition for each sample was calculated based on laboratory glass distilled water as the control. The inhibition produced by hydroxyurea, m-cresol, ZnSO sub 4, and environmental samples was determined. The method was applied to various samples of Tar Creek water and to refinery effluents from various refineries.
W83-03306

WATER QUALITY OF THE UPPER SPOKANE RIVER AND EVALUATION OF METHODS FOR MEASUREMENT OF THE EFFECT OF EFFLUENT UPON PRIMARY AND SECONDARY PRODUCERS,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
W. H. Funk, H. L. Gibbons, R. M. Duffner, T. Notestine, and T. Nielsen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-221705, Price codes: A07 in paper copy, A01 in microfiche. Water Research Center Publication No 48, Washington State Univ., Pullman, January 1983. 130 p, 40 Fig, 10 Tab, 84 Ref, 3 Append. OWRT A-105-WASH(1), 14-34-0001-1151.

Descriptors: Water quality, Management, Methodologies, *Periphyton, *Macroinvertebrate, Sampling, *Washington, Spokane River, Water pollution effects, Recharge, Zinc, Substrates, *Pollutant identification, Indicators, *Water quality control.

This investigation reviews the present state of water quality at ten stations on the Spokane River from the Washington - Idaho Stateline, River Kilometer 153 to the entry of Hangman Creek River Kilometer 117 below the City of Spokane. A major objective of the study was to supply water quality management information in the critical recharge area of the Spokane River. Other objectives were to develop and refine methodologies for obtaining representative periphyton and macroinvertebrate

samples and to investigate the effectiveness of several substrates for long term water quality indication. Nearly all physicochemical water quality indicators showed a measurable increase due to the addition of aquifer waters during the low flow period of the study. There was also a rise in dissolved constituents as the waters moved downstream most likely as a result of urban runoff and increased human activities along the river. Metal content was relatively low considering mining activities in the headwater regions. An exception was zinc which ranged from 5 to 225 micrograms per liter. Artificial and natural substrates are compared in periphyton studies. Optimum colonization periods are discussed. Sampling design deficiencies are reviewed and recommendations made. Certain aspects of direct sampling by suction sampler are discussed as well as bias introduced by the utilization of natural and artificial samplers for long term investigations. Placement of samplers and the use of basket and multiplate samplers are also discussed in the case of macroinvertebrate studies.
W83-03317

THE BIOTA OF OKLAHOMA SPRINGS: NATURAL BIOLOGICAL MONITORING OF GROUNDWATER QUALITY,
Oklahoma Univ., Kingston. Biological Station.
For primary bibliographic entry see Field 2H.
W83-03347

CHARACTERIZATION OF KEL-F-GRAPHITE COMPOSITE (KELGRAF) ELECTRODES AND APPLICATION TO DETECTION IN FLOWING STREAMS,
North Dakota State Univ., Fargo. Dept. of Chemistry.
For primary bibliographic entry see Field 7B.
W83-03369

ORGANICS TRANSPORTED THROUGH SELECTED GEOLOGIC MEDIA: ASSESSMENT OF ORGANICS TRANSPORTED AWAY FROM INDUSTRIAL WASTE DISPOSAL SITES,
Connecticut Univ., Storrs. Inst. of Water Resources.
J. D. Stuart.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-224246, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, April 1983. 20 p, 4 Fig, 5 Tab, 10 Ref, 1 Append. OWRT A-089-CONN(1), 14-34-0001-0107.

Descriptors: *Groundwater pollution, *Soil contamination, *Leachates, *Chemical wastes, *Organic compounds, Soil water, Soil envvironment, Connecticut, Ridgefield, *Pollutant identification, Gas chromatography, Wells, Chlorinated hydrocarbons, *Phenols, Extraction.

Batch extraction methods were used to determine the % removal of four organic chemicals from water. For the removal of phenol at the 90 ppm level, the following important parameters in the local soils were: pH, % clay and % organic matter. For the removal of 1,1,2-trichloroethylene at the 1.1 ppt level: % organic matter, cation exchange capacity, exchangeable basic cations and % clay were found to be important. The following soils in decreasing order were found to be able to remove a water-saturated chlorobenzene solution: muck, clay, then sand. Using purge-and-trap, GC/MS for the analysis 1,1,1-trichloroethane at the 0.30 ppm level in deionized water, the following soils in decreasing order were found effective in removing the chemical: muck, clay, top soil, and then sand. A field hydrogeologic investigation was conducted around an industrial plant located in the town of Ridgefield, Ct. Levels of purgeable halomethanes, one-to-ten times greater than the SNARL (E.P.A.'s - Suggested No Adverse Response Limit) were detected by purge-and-trap, gas chromatographic analyses of water samples taken from two of the nine wells monitored. The well having the highest halomethane levels was in an area known to have been used to store barrels containing used solvents from the metal degreasing process. The location of the second well, on the other side of the property, suggested a second area of contamination not previously recognized. An extended report was made available to state and local water quality authorities.
W83-03375

THE INFLUENCE OF SAMPLE TREATMENT ON NUTRIENT ANALYSIS IN EUTROPHIC WATERS (DER EINFLUSS DER PROBENBEHANDLUNG AUF DIE NAHRSTOFFANALYTIK BEI EUTROPHEN GEWASSERN),
G. Dudel, J. G. Kohl, and A. Nicklisch.
Acta Hydrochimica et Hydrobiologica, Vol 8, No 5, p 489-493, 1980. 2 Tab, 15 Ref. (No English Summary).

Descriptors: *Water analysis, *Sample preparation, *Sample preservation, *Eutrophic lakes, *Nutrients, Water sampling, Nitrates, Orthophosphates, Ammonium, Filtration, Membrane filters, Paper filters, Plankton, Denitrification, Limiting nutrients, *German Democratic Republic.

The treatment of water samples from eutrophic lakes during transport and storage prior to analysis can significantly influence the results of analysis to determine limiting nutrient content. Unfiltered and filtered (through Synpor membranes) samples from the lakes Krebssee and Pehlitzsee (German Democratic Republic) were tested for nitrates and orthophosphate content. Great differences between results were found: e.g., for NO3(-), 11.4 and 13.4 micromol/l was found in unfiltered and filtered samples from Krebssee and Pehlitzsee, respectively, while corresponding figures for Pehlitzsee were 0.71 and 11.2 micromol/l for PO4(3-), unfiltered samples showed 1.93 (Krebssee) and 3.23 (Pehlitzsee) micromol/l, while filtered samples showed 0.12 and 0.33 micromol/l. Further samples from Pehlitzsee were treated in three ways: stored unfiltered at 4 CC for 36 hr, membrane filtration before analysis (1); membrane filtration immediately after sampling; after transportation (2 hr, 4 C), frozen at 17 C until analysis (2); as (2), but with additional paper filtration (3). Again, great differences according to sample treatment were seen, and rank variance analysis revealed that at least two mean values were significantly different for nitrate, ammonium, and orthophosphate determinations. The modified t-test showed that all three treatment variations differed significantly for nitrate analysis. Nitrate and ammonium contents were lowest in treatment (1), highest in (3), while orthophosphate contents varied widely. Nitrate reduction in the stored sample was attributed partly ti denitrification, while other variations were due to the influence of plankton on freenutrient content (through uptake, excretion, cell lysis or metabolic changes within the sample). The results showed that membrane filtration can eliminate or greatly reduce many interference factors in analysis by removing a large portion of particulate content; paper filtration is particularly advantageous. (Gish-FRC)
W83-03392

COPPER(II) COMPLEXING CAPACITIES OF NATURAL WATERS BY FLUORESCENCE QUENCHING,
New Hampshire Univ., Durham. Dept. of Chemistry.
D. K. Ryan, and J. H. Weber.
Environmental Science and Technology, Vol 16, No 12, p 866-872, December, 1982. 3 Fig, 3 Tab, 40 Ref.

Descriptors: *Copper, Surface waters, *Fluorescence quenching, *Complexing capacities, Humic acids, Water analysis, *Titration, *Pollutant identification.

The determination of complexing capacities (CL) values of natural water samples by Cu(2+) titrations using fluorescence and Rayleigh scattering were monitored. From this data CL values were calculated, and average conditional stability products were also determined. In addition various commonly measured water characteristics for the samples were correlated with each other and with the titration results in order to show statistically significant trends. The results indicate that the fluorescence technique directly measures only organic matter complexation, and CL values are unaffected by hydrolysis. Filtered water samples are analyzed at their natural pH under N2 but are otherwise unaltered. The onset of Rayleigh scattering signals the formation of a precipitate and was used to indicate a suitable stopping point for titrations. Scattering and fluorescence trends were similar for all samples except an estuarine sample. A multiple correlation study of several commonly measured water characteristics and the titration parameters showed a statistically significant trend between UV absorbance and CL values. (Baker-FRC)
W83-03396

LAGOON ALGAE AND THE BOD TEST,
P. R. Cosser.
Effluent and Water Treatment Journal, Vol 22, No 9, p 357-358, 360, 361, September, 1982. 2 Ref.

Descriptors: *Testing procedures, *Biochemical oxygen demand, *Algae, Wastewater treatment, Effluent limitations, Oxygen demand, Ponds, Oxidation ponds, Algal growth, Literature review, Lagoons.

The presence of high concentrations of carbonaceous and nitrogenous compounds in domestic sewage makes it an ideal medium for biochemical activity. However, the utility of BOD results derived from samples containing significant amounts of algae is questionable. Under test conditions the rate of oxygen consumption by algae is depressed due to deficiencies in the incubation medium, reduced respiration due to prolonged darkness, suppression of the release of organic excretory products, and survival of the cells so that degradation does not proceed. In all respects oxygen consumption is below that which will occur in the receiving environment, and therefore the use of BOD tests for the assessment of potential oxygen demand is invalid. The major source of error results from the fact that algae remain viable under test conditions, whereas they apparently die and are subsequently degraded in the receiving water. Stipulation of lagoon effluent guidelines and assessment of effluent quality in terms of COD rather than BOD would provide a far more credible foundation for water quality management. (Baker-FRC)
W83-03400

RADIOACTIVITY IN WATER FROM THE RIVER LEA,
North East London Polytechnic (England). Dept. of Applied Physics.
L. R. Day, and C. M. King.
Environmental Pollution, Series B Vol 5, No 1, p 1-8, 1983. 2 Fig, 1 Tab, 5 Ref.

Descriptors: *Potassium radioisotopes, *Radioactivity, Lea River, *United Kingdom, Radioisotopes, *Pollutant identification, Beta counting technique, Tritium.

Radioactivity found in the River Lea, United Kingdom, was attributed to naturally-occurring potassium radionuclides. Samples collected in 1979 and 1981 at 14 stations in the river and its tributaries showed very low levels of activity (maximum 15.6 pCi per liter of water, average 8.2 pCi per liter of water) as measured by the gross beta counting technique, which has an error of 20%. Average beta activity attributed to potassium-40 was 7.5 pCi per liter of water; no tritium was detected. These results indicate that no radioactive pollution is present in the river system. (Cassar-FRC)
W83-03401

A METHODOLOGY FOR ALGAL POPULATION STUDY OF PERIPHYTON: MEASUREMENT OF COVERING RATE (UNE METHODOLOGIE POUR L ETUDE DES POPULATIONS ALGALES DU PERIPHYTON: LA MESURE DU TAUX DE RECOUVREMENT),
Inha Univ., Incheon (Republic of Korea). Dept. of Biology.
B. -J. Yi.
Archiv fur Hydrobiologie, Vol 88, No 1, p 120-127, February, 1980. 3 Fig, 12 Ref. English summary.

Descriptors: *Microscopy, *Algae, *Population dynamics, *Population density, *Microscopic analysis, Algal growth, Aquatic populations, Water analysis, *Korea, Eutrophication, Aquatic productivity.

A methodology applicable to the quantitative and qualitative study of periphyton algal populations is presented. The method uses a glass microscope slide and consists of support frame settlement and substrate fixation, fixation and mounting of fresh material found on the collected substrate, and direct counting. Direct counting is carried out on treated substrata surfaces by adapting phytosociological methods and thus assessing each taxon's covering rate. The glass slide treatment consists of fixation in a mixed solution of 50% fixative and 50% glycerol, dehydration at 40 deg C, and sealing of the cover. For direct counting, the treated slide surface is examined under the microscope at 500 magnification. The number of squares in the opical field (200 squares in a 200 x 200 micrometer field) crossed by one individual taxon, unicellular or filamentous, is determined. The total covering rate of a taxon equals the total number of squares counted during 30 consecutive displacements of the optical field (0.04 sq mm x 30 times). Thus, the visualization of algal species which characterizes a substrate or a sample is permitted. (Small-FRC)
W83-03407

POLAROGRAPHIC DETERMINATION OF LOW LEVELS OF CYANIDE AND METALS IN THE WASTE-WATERS DISCHARGED BY AN ELECTROPLATING PLANT (DOSAGES POLAROGRAPHIQUES DE FAIBLES QUANTITIES D'IONS CYANURE ET DE METAUX DANS LES EUAX REJETEES PAR UN ATELIER DE GALVANOPLASTIE),
Rouen Univ., Mont-Saint-Aignan (France). Lab. de Chimie Analytique.
A. Marechal, J. P. Salaun, and C. Caullet.
Analusis, Vol 9, No 7, p 333-339, 1981. 9 Fig, 4 Tab, 10 Ref. English summary.

Descriptors: *Cyanide, *Polarographic analysis, *Metal finishing wastes, *Electrochemistry, Water pollution, Toxicity, Chromium, Copper, Nickel, Industrial wastes, Zinc, Cadmium, Iron, *France, *Pollutant identification.

Alternating current and differential pulse polarography allow the direct titration of low levels of free cyanide (less than 0.1 mg/liter) in the wastewaters discharged by an electroplating plant. The sample must be preserved correctly. A polarographic peak appears for CN(-) in an ammonical medium if appropriate amounts of ethylenediamine and Cu(II) are present. Its electrochemical origin is discussed as the sum of an anodic and a cathodic process occurring at the same potentials. The cyanide concentration is determined by a three-point standard method. The conditions of preservation and analysis of the main toxic elements (Cr(IV), Cu(II), Ni(II), Zn(II), Cd(II), and total Fe) contained in the effluent were also investigated so that their simultaneous or successive determination can be performed by standard addition without interferences. Both polarographic techniques lead to the same sensitivity limits. (Author's abstract)
W83-03412

DETERMINATION OF PAH IN WATER AND SEDIMENTS BY LOW TEMPERATURE FLUORIMETRY (DOSAGE DES HYDROCARBURES AROMATIQUES POLYNUCLEAIRES DAN LES EAUX ET LES SEDIMENTS PAR FLUORIMETRIE A BASSE TEMPERATURE),
CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses (France).
B. Santoni, and C. Mandon.
Analusis, Vol 9, No 6, p 259-264, 1981. 12 Fig, 4 Tab, 14 Ref. English summary.

Descriptors: *Hydrocarbons, *Fluorometry, *Water analysis, *Sediments, Temperature, Drinking water, Rivers, Chemical analysis, Water pollution, Ultrasonics, Chromatography, *France, *Pollutant identification.

A procedure for the quantitative analysis of PAHs in environmental samples is presented. Low temperature fluorimetry with the Shpol'skii effect was the basic technique. Any of the six hydrocarbons chosen by the EEC as indicators of PAH contamination can be identified in a mixture containing all six hydrocarbons. The determination of each one of the six in a mixture is feasible. For river water or tap water analyses, PAHs are extracted by hexane, with a recovery factor of about 98-100% at concentrations of about 0.03-0.2 micrograms/liter. In river sediments, PAHs are isolated through ultrasonic extraction with DMSO. Compounds that would interfere in fluorimetric determinations are separated by hexane reextraction and chromatography on silica gel. The recovery rate for PAHs is about 90%. Three ng of BaP can be determined in 1 gram of sediment. (Author's abstract)
W83-03413

TRACE TOXIC METALS DETERMINATION IN NATURAL WATERS USING X-RAY FLUORESCENCE SPECTROMETRY ON A CHELATING RESIN CAPTOR (DETERMINATION DE TRACES METAUX TOXIQUES DANS LES EAUX NATURELLES PAR SPECTROMETRIE DE FLUORESCENCE X SUR CAPTEUR DE RESINE CHELATANTE),
Tours Univ. (France). Lab. de Chimie Minerale et d'Hydrologie.
F. Clanet, R. Deloncle, and G. Popoff.
Analusis, Vol 9, No 6, p 276-282, 1981. 3 Fig, 7 Tab, 35 Ref. English summary.

Descriptors: Zinc, Cadmium, Mercury, Lead, *X-ray fluorescence, X-ray spectroscopy, *Heavy metals, Water analysis, Chemical analysis, Toxicity, Sampling, Water pollution, *France, *Pollutant identification.

Zn, Cd, Hg, and Pb at sub-microgram/liter levels in natural waters are preconcentrated by filtration on a captor, which is a plastic cartridge containing Chelex-100 resin. After pelletizing the captor by hot pressing, metals are determined qualitatively and quantitatively by X-ray fluorescence spectrometry. The detection limit is 0.3 ppb for zinc, 0.8 ppb for cadmium, 0.8 ppb for mercury, and 0.2 ppb for lead. This procedure is useful in field studies for the fixation of toxic metal traces in water. Samples are obtained on a well-defined solid medium of small volume which is easy to transport. The sample can be analyzed using X-ray fluorescence spectrometry or by elution of toxic metals for analysis in solution by atomic spectrometry or by polarography. (Author's abstract)
W83-03414

INVERSE-VOLTAMMETRY OF SOME COPPER CHELATES USING A CARBON PASTE ELECTRODE. DETERMINATION OF COPPER IN DRINKING WATER BY OXIDATION OF COPPER DITHIO-OXAMIDE (ZUR INVERS-VOLTAMMETRIE EINIGER KUPFERCHELATE AN DER KOHLEPASTE-ELECTRODE. BESTIMMUNG VON KUPFER IN TRINKWASSER DURCH OXIDATION VON KUPFERDITHIOOXAMID),
Gesamthochschule Siegen (Germany, F.R.). Analytische Chemie.
H. Monien, and U. Gerlach.
Fresenius Zeitschrift fuer Analytische Chemie, Vol 306, No 2/3, p 136-143, 1981. 7 Fig, 3 Tab, 15 Ref. English summary.

Descriptors: *Drinking water, *Water analysis, *Copper, Oxidation, Electrodes, *Pollutant identification, Carbon paste electrode.

A procedure for inverse voltammetry of some copper chelates is described which uses a carbon paste electrode and offers some advantages over mercury electrodes, since interferences are less. Dithio-oxamide, 2,2' diquinoline, neocuproine and bathocuproine can be oxidized at the carbon past electrode as well as the corresponding copper chelates. Dithio-oxamide is particularly convenient as a reagent for the determination of copper in the ppb level in the presence of a 100,000-fold excess of other metals. A sample volume between 1 and 10 ml is sufficient for the d.c. inverse voltammetric determination of copper in drinking water, allowing 3 min for pre-electrolysis. The oxidation of the copper dithio-oxamide chelate occurs near +0.25V (reference electrode: Ag/AgCl/KCl sat.) in a base electrolyte (pH 4.1) containing acetate buffer. (Baker-FRC)
W83-03415

IDENTIFICATION AND QUANTIFICATION OF WATER SOLUBLE COMPONENTS OF OUTBOARD MOTOR EXHAUST AND OF GASOLINE IN A NORTH DAKOTA LAKE,
North Dakota State Univ., Fargo. Dept. of Zoology.
J. D. Brammer, and R. L. Puyear.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-224436, Price codes: A03 in paper copy, A01 in microfiche. North Dakota Water Resources Research Institute Completion Report, North Dakota State University, Fargo, January 1983. 34 p, 8 Fig, 1 Tab, 34 Ref. OWRT A-062-NDAK(1), 14-34-0001-0136.

Descriptors: *Organic compounds, *Gas chromatography, Water analysis, *North Dakota, *Outboard motor exhaust, *Hydrocarbons, *Pollutant identification, Lakes, Recreation, Monitoring, Lake Metigoshe.

Part I: A 7.0 horsepower (HP) and a 10.0 HP outboard motor were operated at 3,500 + or - 200 revolutions-per-minute (rpm) and 1,7-0 + or - 200 rpm respectively for 30 min in a 160 L tank of tapwater. Exhaust hydrocarbons were concentrated by passage through a C sub 18 reverse phase extraction column, and then eluted with either ethylacetate or acetonitrile. Gas-liquid (GLC) and/or high performance liquid (HPLC) chromatography analyses were used for identification and quantification of nine hydrocarbons. Identities were confirmed for seven of these using GLC/mass spectrometry. Four addtional hydrocarbons were tentatively identified with these procedures. Aromatic compounds composed the majority of the hydrocarbons detected; only a few aliphatics were present and those in trace amounts. Part II: A heavily used recreational lake (Lake Metigoshe, N.D.) was monitored for the presence and/or accumulation of water-soluble hydrocarbons. Surface and bottom samples were taken from five sites between March 1979 and January 1980. Samples were analyzed as described above. No hydrocarbons of petroleum origin were identified. Some hydrocarbons, thought to be chiefly of biological origin, were detected and did increase over the boating season. Five variables (date, water, temperature, site location, sample depth, and wind velocity) were statistically analyzed for correlation with mean total hydrocarbon concentrations. Of these five variables, date and water temperature appeared to be the factors most closely associated with total hydrocarbon concentration.
W83-03428

ON THE ANALYSIS OF TRACE ELEMENTS HARMFUL TO HUMANS IN RIVER SEDIMENTS (ZUR ANALYTIK HUMANGEFAHRLICHER SPURENELEMENTE IN FLUSSSEDIMENT),
Erlangen-Nuernberg Univ. (Germany, F.R.). Inst. fuer Geologie und Mineralogie.
B. R. Reichel, B. Reichel, and K. G. Poll.
Gas- und Wasserfach: Wasser/Abwasser, Vol 122, No 2, p 69-72, February, 1981. 6 Fig, 25 Ref. English abstract.

Descriptors: *Trace metals, *Sediments, *Rivers, *Autoclaves, *Water analysis, *Polarographic analysis, Lead, Zinc, Cadmium, Copper, Teflon, Chemical analysis, Acids, Physical analysis, Decomposition, Vaporphase decomposition, *Pollutant identification.

An apparatus and method for the analysis of trace elements in river sediment is described that eases the problems of separating organic from inorganic components. The method is a variant of acid decomposition using a teflon autoclave with hydrofluoric and nitric acids as reagents and utilizing polarography to determine zinc, cadmium, lead, and copper in the decomposed samples to avoid the necessity of further separation processes. Con-

tamination of the sample with the reagents does not occur with the method, which, with its closed-system vapor phase decomposition apparatus, also almost completely eliminates evaporation loss. The rim of the teflon autoclave is lined with aluminum to increase the stability of the teflon (this also decreases the thickness of the teflon wall), metal plates are placed at the top and bottom of the autoclave, a tightening screw is installed at the bottom, and two cup springs are inserted above the top metal plate. The procedure for decomposition to prepare a sample for the polarographic determination of zinc, cadmium, lead, and copper is as follow: measurement of 50 mg finely ground dried sample into the sample holder, addition of 5 ml HN03 into the acid container decomposition of organic components at 170C (duration = 12 hr), cooling of the autoclave, addition of 3 ml HF 936%) and 4 ml HN03 (fuming), decomposition of silicate and quartz at 110C (dur ation = 12 hr), transfer of the dry sample into a 25-50-ml flask, and dissolution with water. The polarographic method of choice is differential pulse stripping voltammetry at a hanging mercury drop electrode (HMDE), which produces highly accurate results. An attempt is being made to develop a teflon capillary to avoid the constant resiliconization that occurs with the addition of a conduction electrolyte to the HMDE. (Gish-FRC)
W83-03442

HEAVY METALS IN FLOWING WATERS AND RIVER SEDIMENTS OF THE WESTERN HARZ REGION (SCHWERMETALLE IN DEN FLIESSGEWASSERN UND FLUSSSEDIMENTEN DES WEST-HARZES,
Thessaloniki Univ., Salonika (Greece). Pollution Control Lab.
For primary bibliographic entry see Field 5B.
W83-03457

RELATIONSHIPS AMONG THE BACTERIA INDICATORS OF FECAL POLLUTION IN THE WATER OF THE RIVER BRENTA (RELAZIONI TRA GLI INDICATORI DI INQUINAMENTO FECALE NELLE ACQUE DEL FIUME BRENTA)
Padua Univ. (Italy). Ist. di Igiene.
A. Zitelli, O. Salvadori, V. Marin, and B. Duzzin.
Igiene Moderna, Vol 75, No 6, p 719-734, 1981. 4 Fig, 8 Tab, 22 Ref. English summary.

Descriptors: *Bioindicators, *Bacteria, *Coliforms, Rivers, *Feces, Water pollution, Escherichia coli, Streptococcus, Salmonella, Statistical analysis, Water analysis, Regression analysis, Least squares method, Correlation analysis, Brenta river, *Italy, Public health, Water quality.

An analysis is presented of relationships among different indicator bacteria and some chemical and physical parameters of the water of the river Benta. Bacterial indicators of fecal pollution include: TBT total plate count at 20 deg C, TBT total plate count at 37 deg C, total coliforms (TC), fecal coliforms (FC), and fecal streptococci (FS). The FC/FS ratios decreased downriver and were consistently high in low lying areas. Least squares regression analysis was performed on different parameters. These results were consistent with other statistical results, which indicated no correlation between FC and TC, a correlation of one between FC and TBT at 37 deg C, and a correlation of one been FS and TBT at 37 deg C. Correlation coefficients for these relationships were significant at a 99.9% probability level. With the exception of BOD5, no significant correlations were found between single indicator bacteria and other chemical or physical water parameters. While E. coli occurred at a high rate, no salmonellae were isolated. (Small-FRC)
W83-03485

APPLICATION OF KELGRAPH TO ELECTROCHEMICAL DETECTORS FOR FLOW INJECTION ANALYSIS AND HIGH PERFORMANCE LIQUID CHROMATOGRAPHY,
North Dakota State Univ., Fargo. Dept. of Chemistry.
D. E. Weisshaar.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-226928, Price codes: A05 in paper copy, A01 in microfiche. Water Resources Research Institute Completion Report, North Dakota State University, Fargo, January 1983. 81 p, 12 Fig, 6 Tab. OWRT A-063-NDAK(1), 14-34-0001-9036.

Descriptors: *Chemical analysis, *Water analysis, *Electrochemistry, *Chromatography, Electrodes, Organic compounds, Phenols, Organic waste, Graphite, Kel-F, Electron microscopy detector, *Pollutant identification.

The active area of Kel-F graphite composite (Kelgraf) electrodes determined from short time chronoamperometric data agree well with the weight percent of graphite in the composite and with the percent conducting carbon on the surface determined from x-ray photoelectron spectroscpopy(XPS). Kelgraf electrodes and composite electrodes in general are predicted to exhibit a signal to nosie (S/N) enhancement over continuous electrodes like glassy carbon. The S/N enhancement depends on the active area and the active and inactive site dimensions on the electrode. For Kelgraf these parameters can be tailored to a specific application by control of the percent of graphite in the composite and the particle sizes of the Kel-F and graphite use in fabrication. The performance of Kelgraf as an electrode for electrochemical detection in flowing streams is discussed, including the determination of the optimum electrode composition and the linear dynamic range of the detector. The detector was applied to the determination of phenols in groundwater and coal gasification waste water. Detection limits ranged from 3-15 pg for a variety of phenols. No fouling of the electrode was evident. Evidence based on chronoamperometry, XPS, SEM, cyclic voltammetry and capacitance measurements point to the existence of a partial thin film of Kel-F over portions of the graphite sites. The implications of the presence of such a film are also discussed.
W83-03490

5B. Sources Of Pollution

BIODEGRADATION OF 1,3-DINITROBENZENE,
Army Medical Bioengineering Research and Development Lab., Fort Detrick, MD.
W. R. Mitchell, and W. H. Dennis, Jr.
Journal of Environmental Science and Health, Part A, Vol 17, No 6, p 837-853, 1982. 4 Fig, 1 Tab, 26 Ref.

Descriptors: Industrial wastes, *Aromatic compounds, *Degradation, Fate of pollutants, Organic compounds, *Dinitrobenzene, *Microbial degradation, *Biodegradation, *Tennessee River, Adaption, Tennessee, Maryland.

1,3-Dinitrobenzene was degraded microbially in water samples taken downstream of the Volunteer Army Ammunition Plant, Chattanooga, Tennessee, but not in water from streams near Frederick, Maryland. Degradation of the 5 microgram per liter solution proceeded after a 10 day lag and was complete by Day 15. Microorganisms from the Tennessee River were able to grow with 1,3-dinitrobenzene as the sole carbon source with a half-life of about 1 day. Enriching the cultures degraded the compound to carbon dioxide with a half-life of 9.7 days. The 1,3 dinitrobenzene-adapted organisms did not grow with the other munitions manufacturing wastes tested: 1,3 dinitrobenzene, 1,4-dinitrobenzene, 3,5-dinitroaniline, 1,3,5-trinitrobenzene, or nitrobenzene. (Cassar-FRC)
W83-03155

INFLUENCE OF LAND UTILIZATION ON HYDROCARBON RUNOFF POLLUTION,
New Jersey Dept. of Environmental Protection, Trenton.
J. Kashner, and J. V. Hunter.
Journal of Environmental Science and Health, Part A, Vol 18, No 1, p 135-144, 1983. 3 Tab, 7 Ref.

Descriptors: *Land use, *Hydrocarbons, *Storm wastewater, Water pollution sources, Fate of pollutants, Sediments, Storm runoff, *New Jersey, Particulate matter, Organic compounds, Aromatic compounds, Aliphatic hydrocarbons, Volatile solids, New Brunswick.

Hydrocarbon pollution from two similar streams with different land uses near New Brunswick, New Jersey, was determined from sediment samples. Mile Run was 38% residential, 19% industrial/commercial, and 43% open. Beaverdam Brook was 82% residential and 18% open. The concentration of aliphatic and aromatic hydrocarbons in Mile Run sediments (total 0.05-0.47%, mean 0.18%) averaged 3-4 times the concentrations of these hydrocarbons in Beaverdam Brook sediments (0.006-0.240%, mean 0.052%). The differing levels of organic matter in the two types of sediments did not account for the differences in concentrations of hydrocarbons. Hydrocarbons in Mile Run sediments were less aliphatic in character than the Beaverdam Brook sediments. (Cassar-FRC)
W83-03156

APPLICATIONS OF A SERRATIA MARCESCENS BACTERIOPHAGE AS A NEW MICROBIAL TRACER OF AQUEOUS ENVIRONMENTS,
Wessex Water Authority, Poole (England). Divisional Microbiology Lab.
D. F. Drury, and D. C. Wheeler.
Journal of Applied Bacteriology, Vol 53, No 2, p 137-142, October, 1982. 3 Fig, 3 Tab, 13 Ref.

Descriptors: *Fate of pollutants, *Bacteriophage, *Tracers, *Flow characteristics, *Bioindicators, Viruses, Microorganisms, Microbiological studies, Pollutant identification, Flow rates, Retention time.

A bacteriophage of Serratia marcescens was evaluated as a tracer of flow in four stages of a sewage treatment works process, as a tracer of dispersion of sewage effluent in the receiving water of a treatment plant and as a tracer of river-water flow rate. The NCIB 10645 phage of S. marcescens compared favorably with lithium chloride in demonstrating flow characteristics and retention times of the aeration lane, secondary sedimentation process, trickling filter, and deep shaft pilot plant of a sewage treatment operation. The phage also exhibited virtually identical distribution in a marine harbor to spores of Bacillus subtilis var. niger 36 to 48 hr after their addition to the final effluent of a sewage works which discharged into an adjacent bay. The bacteriophage was also useful in accurately measuring the transit times of river water between two points under various flow conditions. (Geiger-FRC)
W83-03165

EVALUATING THE RELEASE OF SOLUBLE COMPONENTS FROM SEDIMENT,
Technion - Israel Inst. of Tech., Haifa.
Y. Avnimelech, M. Yamamoto, and R. G. Menzel.
Journal of Environmental Quality, Vol 12, No 1, p 86-91, January/March, 1983. 6 Fig, 3 Tab, 22 Ref.

Descriptors: *Nutrients, *Adsorption, *Sediments, Lakes, Ponds, Eutrophied lakes, Fate of pollutants, Ammonium, Phosphorus, Organic carbon, Nitrogen, Organic matter, Distribution coefficient, *Oklahoma.

Sediments from flood detention reservoirs and farm ponds in Oklahoma were equilibrated with water to study the distribution of soluble components between sediments and the pore or overlying water. Water bodies were of varied eutrophic states. The extraction of soluble components was described as a function of a linear distribution of the soluble components between the solid and liquid phases and through mass balance considerations. The sizes of potentially available nutrient pools and the distribution coefficients were calculated for ammonium, organic N, and organic C. Ammonium, which is bound onto the solid phase as an exchangeable cation, showed very good correlation between experimental and theoretically derived data over the experimental dilution range (up to 1:400 sediment/water ratios). Behavior of

organic C and organic N is more complex. Phosphorus did not follow the model. (Cassar-FRC)
W83-03168

THE ROLE OF DELAWARE RIVER FRESHWATER TIDAL WETLANDS IN THE RETENTION OF NUTRIENTS AND HEAVY METALS,
Rider Coll., Lawrenceville, NJ. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W83-03169

THE EXTENT AND NATURE OF RAINFALL-SOIL INTERACTION IN THE RELEASE OF SOLUBLE CHEMICALS TO RUNOFF,
Agricultural Research Service, Durant, OK. Water Quality and Watershed Research Lab.
L. R. Ahuja, and O. R. Lehman.
Journal of Environmental Quality, Vol 12, No 1, p 34-40, January/March, 1983. 9 Fig, 10 Ref.

Descriptors: *Infiltration, *Solute transport, *Agricultural runoff, Runoff, Nonpoint pollution sources, Permeability, Mixing, Water pollution sources, Soil properties, Soil surfaces, Soil solution, Fate of pollutants.

Soluble soil chemicals were readily released into runoff from soils with a surface layer more permeable than the underlying layers. This was determined from experiments in which simulated rainfall was applied to boxes of soil (fine sandy loam, loam, and clay) prewetted with a 4000 ppm bromide solution. The boxes were constructed to allow three degrees of infiltration during rainfall: free, none, and reduced. In all soils Br levels in runoff were 1-2 orders of magnitude higher from the boxes with no infiltration than from the boxes with free infiltration. The reduced-infiltration boxes had intermediate Br levels in the runoff. This showed that the mixing zone concept currently used in models for the release of chemicals in runoff from land surfaces is not totally valid. With a 1 hour rainfall (6.8 cm of rain) Br was lost to runoff from as deep as 2 cm in the soil in the no-infiltration boxes. The amount released decreased with depth. The mechanism for transfer of a chemical from below a thin soil surface layer is probably a pumping action of, or turbulence generated by, the raindrops' impact. The mixing zone concept was modified by addding an exponential decrease in the degree of mixing with depth and a piston displacement of soil solution by infiltration. Results suggest that solute transport is increased in clay pan soils, wet areas, and where tillage practices have greatly increased permeability of the surface soil. (Cassar-FRC)
W83-03170

HORSES IN SUBURBIA,
Fairfield County Conservation District, Monroe, CT.
For primary bibliographic entry see Field 5G.
W83-03176

THE POTENTIAL FOR ACID PRECIPITATION DAMAGE TO LAKES OF THE SIERRA NEVADA, CALIFORNIA,
California Univ., Berkeley.
J. Harte, J. Holdren, and K. Tonnesson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-214825, Price codes: A04 in paper copy, A01 in microfiche. California Water Resources Center Completion Report, University of California, Davis, April 1983. 13 p, 3 Fig, 1 Tab, 10 Ref, 3 Append. OWRT-A-081-CAL(1).

Descriptors: *Acid rain, *Chemistry of precipitation, *Lakes, *California, *Mountain lakes, Environmental effects, Alkalinity, Hydrogen ion concentration, Sierra Nevada region.

Acid precipitation in the western United States is now being measured and monitoring networks are being set up to determine the nature and extent of its occurence. In California two recent studies have documented instances of acidic deposition. It would appear that in the State the nitrate component often outweighs the sulfate contribution in rainfall. One of the areas of California potentially sensitive to acidic deposition is the Sierra Nevada, located along the eastern boundary. A report on sensitive areas in North America identifies the Sierra as a region characterized by poorly buffered soils and granite based lakes. The subalpine and alpine lakes in this region share many of the characteristics of lakes adversely affected by acid deposition in other parts of the U.S. and the world. For this investigation selected subalpine lakes of the western slope of the Sierra were chosen for study, to establish baseline water quality which would allow for the identification of chemical and biological changes due to acidic doposition. It was then attempted to simulate the ecosystem stress of increased acidic deposition, particularly in the form of snowmelt, on these systems by performing microcosm experiments in the laboratory. These experiments were particularly concerned with recording changes in concentrations of micronutrients which might be leached from lake sediments with increasing acidification. This phenomenon is particularly important to study in the light of finds on the importance of aluminum leaching in the Northeast which has led to toxic effects on biota in Adirondack lakes. (Snyder-California)
W83-03182

DISTRIBUTED SOURCE MODEL FOR PESTICIDES IN THE IOWA RIVER,
Iowa Univ., Iowa City. Dept. of Civil and Environmental Engineering.
J. L. Schnoor.
Iowa State Water Resources Research Institute, Publication No 107, Iowa State University, Ames, January 1983. 39 p, 8 Fig, 2 Tab, 1 Append. OWRT A-070-IA(1), 14-34-0001-8017.

Descriptors: *Pesticides, *Dieldrin, *Model studies, *Nonpoint pollution sources, Water quality management, Rivers, Sediment-water interfaces, Iowa River, *Iowa, *Path of pollutants, Simulation analysis, Sediment transport, Pesticide transport.

A time-variable water quality model of pesticide concentration in streams and rivers was developed. The pesticide concentrations of dieldrin in the Iowa River was used to calibrate the model. However, due to the lack of field data before and after implementation of best management practices (BMPs), a quantitative evaluation of the improvements due to BMPs was not possible. The model consisted of a series of complete-mixed compartments to simulate the dissolved hydraulic transport of the pesticides. A sediment bed compartment was included to simulate the interactions of the pesticide between the sediment and dissolved phases. The model gave reasonable simulation results but complete verification was not possible because of the lack of field data.
W83-03186

MODIFICATION OF POLLUTANT HYDROLYSIS KINETICS IN THE PRESENCE OF HUMIC SUBSTANCES,
Environmental Research Lab., Athens, GA.
E. M. Perdue, and N. L. Wolfe.
Environmental Science and Technology, Vol 16, No 12, p 847-852, December, 1982. 8 Fig, 5 Tab, 16 Ref.

Descriptors: *Humic acids, *Hydrolysis, *Kinetics, *Fate of pollutants, Water pollution sources, Organic compounds.

Effects of humic substances on the kinetics of hydrolysis of the 1-octyl ester of (2,4-dichlorophenoxy)acetic acid (2,4-DOE) were investigated. In distilled water at pH 4 and above, hydrolysis is governed by second-order alkaline hydrolysis kinetics. The hydrolysis kinetics are complicated by sorption of the ester to the glass container walls. System specific sorption-desorption rate constants for the ester are relatively small. Competitive equilibrium studies between glass walls, water, and dissolved humic substances give partition coefficients for the humic material of 10,000 to 100,000. Similarly, hydrolysis studies in the presence of various humic substances give calculated partition coefficients in the range 10,000 to 100,000. General acid-base catalysis by dissolved humic substances, if operative at all, is masked by the sorption phenomenon. The overall effect of the humic material is an apparent decrease of the alkaline hydrolysis rate constant by a factor equal to the fraction of the ester associated with the humic substances. (Baker-FRC)
W83-03193

CONTROL OF TRIHALOMETHANES IN BARCELONA'S WATER SUPPLY (CONTROLE DES TRIHALOMETHANES DANS LES EAUX D'APPROVISIONNEMENT DE BARCELONE),
Instituto de Quimica Bio-Organica, Barcelona (Spain).
J. Rivera, and F. Ventura.
Aqua, No 5, p 0469-0474, 1982. 4 Fig, 2 Tab, 8 Ref.

Descriptors: Water supply, Water quality, *Raw water, *Potable water, Water pollution, Rivers, Median tolerance limit, Halogens, *Bromides, Industrial wastes, *Mine drainage, Mineral industry, Drinking water, Chlorination, Llobregat River, *Spain, *Water pollution sources, *Trihalomethanes, Disinfection, Barcelona, Salt mines.

The method and results of a water quality study are described. Raw water taken from the Llobregat river, Spain, as well as different points within the water treatment plant at Sant Joan Despi in 1979, 1980, and 1981 was analyzed for trihalomethane contamination. This water is supplied to the city of Barcelona and surrounding areas. Results show higher levels for bromemethanes than those commonly cited in the literature. The total trihalomethane concentration is often higher than 100 parts per billion, which exceeds the upper limit for drinking water established by the United States Environmental Protection Agency. These results are in agreement with the presence of significant amount of organic matter in raw water containing precursors of trihalomethanes found at the chlorination process. The presence of bromomethanes is believed to be linked to bromide in the raw water of salt mines located upstream. (Titus-FRC)
W83-03210

TUFA PRECIPITATION AND ITS EFFECT ON DRAINAGE OF INTERSTATE HIGHWAYS IN NORTHEASTERN OHIO,
Kent State Univ., OH. Dept. of Geology.
R. M. Feldmann, D. J. Biros, and D. L. Middleton.
Bulletin of the Association of Engineering Geologists, Vol 19, No 4, p 347-370, November, 1982. 18 Fig, 24 Ref.

Descriptors: *Tufa, *Drainage, *Highways, *Ohio, Geochemistry, Hydrogeology, Calcium carbonate, Drainage systems, Roads, Slag, Construction, Drainage engineering.

Calcareous tufa has been observed occluding drain outlets and catch basins as well as covering slopes at 124 localities in Cuyahoga, Portage, Summit, and Medina counties in northeastern Ohio. Blockage of the drains by this material is impeding drainage of the subbase, which may have harmful consequences such as slope failure on saturated embankments, freeze-thaw damage, pumpout of bedding materials under loading of flexible pavement areas, and deterioration in mechanical properties of pavement. Regional geological studies, hydrogeological studies, and geochemical analyses have been employed to identify the source and mode of origin of this material. No correlation was found between tufa formation and regional geologic and hydrogeologic conditions. Geochemical analysis of water collected from subbase drain outlets and of an array of construction material leads to the conclusion that slag, when used as a subbase material, is sufficiently soluble to affect the pH of drainage water and to provide the calcium deposited as tufa. Solution of calcium hydroxide in slag in the subbase elevates the pH of drainage water above 10.3 and produces an environment in which calcium carbonate can be precipitated. The problem of tufa deposition will continue in northeast Ohio as long as slag is used as a subbase material. However, careful maintenance of the highway surface to reduce the amount of water entering the drainage system through edge joints and cracks in the pavement will significantly

reduce the magnitude of the problem. (Baker-FRC)
W83-03213

FISH FARM EFFLUENTS--CAUSE FOR CONCERN,
J. F. Solbe.
Water, No 43, p 22-25, March, 1982. 1 Fig, 3 Tab.

Descriptors: *Fish farming, *Water quality, Rivers, Water pollution sources, Suspended solids, Dissolved oxygen, Biochemical oxygen demand, Phosphorus, Water pollution effects, Nitrogen, *United Kingdom.

Increasing fish farming in fresh water in the United Kingdom has led to concerns regarding the effects of these farms on water quality. Fish farms, which are often located upstream of potable water supply intakes, do not treat water they use prior to discharge to the receiving waters. In many cases, they use the whole flow of the river, since the production of a ton of freshwater fish requires the utilization of about 250 mission liters of water. A survey was conducted to determine the types of fish farms operating in 1980; their rates of production; their sources of water; the treatment, quality, and fate of their effluents; the usage of chemicals; and the nature of the water to which their effluents were discharged. Although most fish farms were small, 10 percent of the farms accounted for over half of the total production of the farms surveyed. In addition, in some instances series of several farms were located on a given stretch of river. Although the majority of fish farms use some chemicals, often antibiotics or antibacterial agents, little is known about the effects of these chemicals on wild fish populations, other farmed fish, or humans. Water passing through fish farms experienced a decrease in dissolved oxygen concentration and increases in biochemical oxygen demand, suspended solids, phosphorus, ammonia, nitrite, and nitrate. The increases in nitrogen and phosphorus can pose problems for oligotrophic and other sensitive waters. Suspended solids are the most obvious cause of complaint, with the average fish farm discharging the same amount of solids as an efficient sewage works serving 21,000 people. Although only 15 percent of the fish farms have been involved in pollution incidents, further development of the indsutry could lead to problems on reaches of rivers where one or more fish farms already exist. (Carroll-FRC)
W83-03237

FREE IONIC NICKEL ACCUMULATION AND LOCALIZATION IN THE FRESHWATER ZOOPLANKTER, DAPHNIA MAGNA,
Toronto Univ. (Ontario). Dept. of Botany.
T. M. Hall.
Limnology and Oceanography, Vol 24, No 4, p 718-728, July, 1982. 6 Fig, 3 Tab, 24 Ref.

Descriptors: *Fate of pollutants, *Nickel, *Daphnia, *Kinetics, *Adsorption, Accumulation, Excretion, Model studies, Heavy metals, Metals, Crustaceans, Absorption, Aquatic insects, Radioactive tracers, Zooplankton.

The processes which lead to the accumulation of free radioactive ionic nickel by Daphnia magna from solution were examined and formulated into a model which describes accumulation at different concentrations. The kinetics of nickel uptake and distribution by various body components were included to substantiate accumulation data and further the understanding of nickel turnover by Daphnia. Adsorption was found to play only a small role in the accumulation of nickel. Adsorption by exuviae alone was complete in 1 hr. Excretion experiments with intact daphnids demonstrated the presence and kinetics of a more rapidly exchanging pool of more losely bound cation than absorbed Ni. The accumulation rate eventually approached zero, signifying an equilibrium between the uptake and loss of nickel. The appearance and distribution of nickel within the body fluid, carapace, gut, filtering device, and eggs supported findings of other researchers on nickel accumulation and excretion in daphnids and other aquatic crustaceans and added to the understanding of nickel assimulation in the aquatic biosphere. (Geiger-FRC)
W83-03256

SELENIUM IN REDUCING WATERS,
California Univ., Santa Cruz. Center for Coastal Marine Studies.
G. A. Cutter.
Science, Vol 217, No 4562, p 829-831, August 27, 1982. 2 Fig, 14 Ref.

Descriptors: *Selenium, *Anaerobic conditions, *Speciation, Fate of pollutants, Fjords, Oxidation-reduction potential, Zooplankton, Organic compounds, Deep water, Chemical reactions, Saanich Inlet, *British Columbia.

Selenium species were investigated in Saanich Inlet, a fjord on the coast of Vancouver Island, in May 1981. Total water depth was 196 m. The interface between H2S and oxygen was at 175 m; the suboxic zone, 110-170 m; and the oxic zone, 110 m to the surface. Total dissolved Se increased in concentration with depth from about 0.65 nM per kg on the surface to about 1.40 nM per kg at 120 m and decreased to 1.00-1.25 in the deeper anoxic water. Selenite increased from zero on the surface to a maximum of 0.30 nM per kg at 80 m and decreased from about 0.75 nM per kg at the surface to detection limit values (0.01 nM per kg) at 180 m. Hydrogen selenide concentrations were near the detection limit in the anoxic zone. Organic selenide, not detected at the surface, increased gradually to 1.25 nM per kg at the fjord bottom. Both selenate and selenite were present in the oxic waters, although selenate is the only thermodynamically predicted form. The very low levels of selenate and selenite in the anoxic waters indicated a removal mechanism. Although hydrogen selenide is the thermodynamically predicted form in anoxic waters, it was virtually absent, and the dominant species was organic selenide. This may be a result of incorporation of Se into biogenic particulates, which degrade and dissolve in the bottom waters and/or undergo oxidation-reduction reactions. Data suggest that some Se in biogenic matter undergoes a multistep regeneration. The organic selenide state may be the final regeneration step under anoxic conditions, whereas selenite and selenate may be the final regeneration step in oxic water. (Cassar-FRC
W83-03266

STUDY OF THE CHANGES IN RIVER WATER QUALITY (ETUDE DE L'EVOLUTION DE LA QUALITE DES EAUX DE RIVIERE),
Montpellier-2 Univ. (France). Lab. d'Hydrologie Mathematique.
A. Guilbot, B. Picot-Reboul, M. Bouchaud, and M. Roux.
Water Research, Vol 16, No 7, p 1173-1187, July, 1982. 9 Fig, 7 Ref.

Descriptors: *Rivers, *Water pollution effects, *Water quality, *Statistical analysis, *Graphical analysis, Mathematical studies, Water pollution control, Water analysis, Water pollution sources, Catchment areas, River basins, Water quality management, *France, L'Adour, La Dordogne.

A methodology was developed to determine river water quality and to assess the effectiveness of control measures. The method was tested in two catchment areas in France: L'Adour (15,000 sq km) and La Dordogne (24,000 sq km). Before implementation of the method, it was necessary to collect data on the identification and quantity of pollution sources as well as annual statistics for sampling stations. Statistical analysis was carried out on parameters available for 1971 through 1976. Principal components were analyzed, and all data were analyzed using STATIS. Research was carried outon the causal relationship between water quality and the pollution sources. A simple graphical method is proposed to explain the effect of a strongly preponderant pollutant. A method using BOD was developed for general cases where there are several pollutants. This method compares values measured in the river with estimates of inflows and measurements made in upstream basins. Local and general tendencies resulting from intervention by the Agence Financiere de Bassin can be determined. It will be necessary to extend the statistical method to parameters other than BOD. (Small-FRC)
W83-03267

IDENTIFICATION AND ASSESSMENT OF EFFLUENT RESIDUALS IN TREATED LEACHATE FROM LANDFILL DISPOSAL SITES,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 5E.
W83-03272

THE MOVEMENT OF NITRATES, PHOSPHATES, AND FECAL COLIFORM BACTERIA FROM DISPOSAL SYSTEMS INSTALLED IN SELECTED CONNECTICUT SOILS,
Connecticut Univ., Storrs. Inst. of Water Resources.
H. D. Luce, and T. G. Welling.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-219808. Completion Report, June 1983. 107 p, 63 Fig, 10 Tab, 39 Ref. OWRT A-088-CONN(1), 14-34-000-0107.

Descriptors: *Septic tanks, Septic wastewater, Leaching, Groundwater pollution, Nitrogren, *Nitrates, Nitrogen removal, Nitrification, Nutrient removal, Phosphorus, Ammonium, Denitrification, Chlorides, *Coliforms, Pathogens, Watersheds, Land use, *Soil disposal fields, Soil-type, Soil chemistry, Soil filters, Geohydrology, Glaciohydrology, Glacial soils, Connecticut, *Phosphates.

Groundwater monitoring of five septic tank leaching systems was accomplished. Site 1 consisted of a single system installed in fill over a sandy soil, located upgrade of a wetlands. Site 2 consisted of a 10.1 ha residential watershed in which four systems were studied in detail. This watershed contained a complete topo-drainage sequence of soils underlain by compact till. Wells were utilized to sample groundwater on a monthly basis. In situ measurements and laboratory analyses of various parameters revealed that the soils studied were effective in removing phosphorus, nitrogen, total coliform bacteria and fecal coliform bacteria. The processes of nitrification and denitrification were observed. The groundwater and surface water quality of this residential watershed was compared with two other watersheds that were similar in soils and topography. One of these two watersheds was in forestry, the other in forage crops. The concentraion of P was similar in all watersheds. The concentration of soluble N was less than 1 mg/1 in the stream waters exiting the forested watershed and was dominantly in the NH sub 4-N form. The concentration of soluble nitrogen exiting the other two watersheds was about 3 mg/1, being dominantly in the NO sub 3-N form in the farmed watershed and being equally divided between NH sub 4-N and NO sub 3-N in the residential watershed. There is some evidence that the amount of soluble N exiting the latter two watersheds was greatly affected by denitrification.
W83-03276

POST-MINING NEUTRALIZATION OF ACIDIC SURFACE MINE LAKES,
Southern Illinois Univ. at Edwardsville. Dept. of Biological Sciences.
R. B. Brugam, M. A. Carlson, S. Chakraverty, and M. Lusk.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-219923, Price codes: A06 in paper copy, A01 in microfiche. Water Resources Center Research Report No 178, Univ. of Illinois, Urbana, April 1983. 103 p, 35 Fig, 9 Tab, 57 Ref. OWRT B-138-ILL(3), 14-34-0001-1220.

Descriptors: *Acid mine drainage, *Strip mine lakes, *Lake sediments, Paleolimnology, *Diatoms, *Lead radioisotopes, *Sedimentation rates, Chemical composition, *Neutralization, Mine lakes, Illinois, Indiana, Missouri.

Twenty core samples and 54 surface sediment samples were taken from surface mine lakes in Missou-

ri, Illinois, and Indiana to determine the rates of neutralization of acid mine lakes. Sediment samples were analyzed for diatom microfossils, selected chemical elements, and the radionuclide, lead-210. The surface samples showed that there were strong differences in diatom microfossils between acidic and neutral lakes but there was no strong difference in sediment chemical composition between acidic and neutral lakes. Of 20 lakes from which cores were examined, 9 showed diatom evidence of neutralization and one of acidification over time. Cores from 5 of these were dated using lead-210 analysis. Diatom microfossils showed that neutralization took from less than 3 years to 30 years to occur. Comparisons between lake sediment and water column chemistry indicated that neither sulfide deposition nor H sub 2 S outgasing is likely to play a major role in the neutralization process. Chemical analyses of lake sediment showed that the sediment is a sink for heavy metals. These metals are held as sulfides. There is also a considerable fraction of metal ions strongly bound to clays. This research demonstrates that acid lake neutralization is common, that it occurs over moderate time spans and that the rate is controlled by rates of acid supply from the watershed.
W83-03278

INFLUENCE OF AGRICULTURAL DRAINAGE ON WATER QUALITY,
Delaware Univ., Newark. Dept. of Agricultural Engineering.
W. F. Ritter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220327. Water Resources Center Completion Report, Univ. of Delaware, Newark, April 1983. 32 p, 2 Fig, 18 Tab, 20 Ref. OWRT A-056-DEL(1), 14-34-0001-2108.

Descriptors: Water quality, *Surface drainage, *Nitrogen, *Phosphorus, *Agricultural watersheds, Agricultural hydrology, *Delaware, Land use, Marshyhop Creek watershed, Pepper Creek watershed, Upper Choptank River watershed.

Three agricultural watersheds located in western Kent Co. in the Choptank River basin were monitored from March to September, 1982. Drainage construction was in progress on one of the watersheds, another watershed had no drainage construction, and the third watershed had drainage constructed approximately ten years of age. Storm runoff and baseflow samples were analyzed for ammonia, nitrate nitrogen, organic nitrogen, ortho phosphorus, total phosphorus, turbidity, suspended solids, and dissolved solids. Ongoing drainage construction had more impact on baseflow chemical parameters concentrations than storm runoff concentrations. On the watershed where drainage construction was in progress, nitrate nitrogen, total phosphorus, turbidity, suspended solids, and dissolved solids concentrations were increased. Suspended solids concentrations were higher on the watershed where no drainage has been constructed for some storms because of sediment flotation.
W83-03289

EFFECT OF INCORPORATION OF FALL-APPLIED FERTILIZER ON RUNOFF LOSSES OF NUTRIENTS AND SOIL FROM SOYBEAN GROUND,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W83-03298

PHOSPHATE RELEASE IN LABORATORY SOIL COLUMNS,
Rhode Island Univ., Kingston. Dept. of Plant and Soil Science.
T. J. Bicky, and W. R. Wright.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220384, Price codes: A02 in paper copy, A01 in microfiche. Water Resources Center Technical Report No 9, Rhode Island Univ., Kingston, September 1982. 6 p, 2 Tab, 2 Ref. OWRT A-075 RI(1), 14-34-0001-1142.

Descriptors: *Phosphorus, Cesspools, Soil chemistry, Pollutant identification, Soil columns,.

A soil column study was initiated to determine the magnitude of phosphorus release from phosphorus enriched soil treated with various rejuvenation products. Columns filled with soil collected at the base of seepage pits (cesspools) were treated with 100 ml solutions of 50% H 2S04, 16% H202, 1% Drainz, 1% enzyme and distilled water. Total phosphorus was determined on column extracts after contact times of 24 and 168 hours. The results indicate that the H2S04 treatment extracted the greatest amount of phosphorus from the soil followed by peroxide H202, Drainz and enzyme treatments. Increasing contact time increased amounts of total phosphorus in the H2S04 and enzyme treatments. Problems associated with the fate of release phosphorus from these systems needs to investigated further.
W83-03301

THE FATE OF ANTIFOULANT ORGANOTIN COMPOUNDS IN WATER SYSTEMS,
District of Columbia Univ., Washington. Coll. of Physical Science, Engineering, and Technology.
I. J. Posey, and G. Eng.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220590, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Center Report No 46, Univ. of the District of Columbia, Washington, D. C., May 1983. 22 p, 9 Fig, 2 Tab, 21 Ref. OWRT A-020-DC(1), 14-34-0001-2109.

Descriptors: *Antifoulants, *Water pollution sources, *Organotin compounds, Fate of pollutants, *Infrared analysis, Leaching, Chromatography, *Pollutant identification, Residues.

Several antifoulant organotin compounds, Ph sub 3 SnOH, Ph sub 3 SnCl and Ph sub 3 SnOCOCH sub 3, were leached by suspending them in distilled water and shaking mechanically for periods up to two weeks at room temperature. Benzene or chloroform extracts of these aqueous solutions were evaporated to dryness and the infrared spectra of the resulting residues were obtained. Except for the residue resulting from the extract of aqueous Ph sub 3 SnOCOCH sub 3, the infrared spectrum of each residue was identical to that of the starting organotin compound. The infrared spectrum of the residue obtained from the chloroform extract of aqueous Ph sub 3 SnOCOCH sub 3 which had been shaken for seven days showed the presence of Ph sub 3 SnOH as confirmed by the presence of a small doublet around 910 and 897 cm -super 1. The pH measurements on the aqueous solutions of these organotin compounds showed a decrease in pH with time. These results are perhaps indicative of an ionization of the organotin compounds in water. TLC experiments using various developing solvents did not allow for the resolution of mixtures of Ph sub 3 SnCl, Ph sub 3 SnCl and Ph sub 3 SnOCOCH sub 3; therefore, TLC was not feasible for use in this study.
W83-03315

AN EVALUATION OF SEDIMENTS IN THE MIDDLE RIO GRANDE, ELEPHANT BUTTE RESERVOIR, AND CABALLO RESERVOIR AS POTENTIAL SOURCES FOR TOXIC METERIALS,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Chemistry.
C. J. Popp, D. J. Brandvold, T. R. Lynch, and L. A. Brandvold.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-221754, Price codes: A06 in paper copy, A01 in microfiche. New Mexico Water Resources Research Institute Report No 161, Las Cruces, March 1983. 97 p, 11 Fig, 39 Tab, 61 Ref, 3 Append. OWRT A-065-NMEX(1), 14-34-0001-1133.

Descriptors: *Heavy metals, *Organic pesticides, Water quality, Fish tissues, Chlorinated organic pesticides, Pesticides, Radionuclides, Reservoir sediments, *Suspended sediments, Middle Rio Grande River, *New Mexico, *Path of pollutants, Elephant Butte Reservoir, Caballo Reservoir.

The distribution of a large number of priority pollutant trace metal and organic species in water and sediments in surface waters in the Middle Rio Grande region of New Mexico has been surveyed. In addition to sediments and water, limnological data was collected on the reservoirs, radionuclide and particle size analysis was performed on the sediments and a limited number of fish were surveyed for trace metals and organics. The sediments carry elevated levels of the metals Hg, Cd, As, Se, and U and fish may be biomagnifying Hg, Pb, and V through the food chain. Mercury levels in fish are high enough to warrant concern from a health standpoint. Detectable levels of 18 different chlorinated organic pesticides were found in samples of water and bottom sediments. These pesticides were found predominantly in association with suspended particulates or with fine particles in the bottom sediments. Pesticides were detected more frequently in the Fall than in the Spring. Because of heavy sediment inputs contaminated by adsorbed pesticides, the calcultated annual input to Elephant Butte Reservoir lies between 900-11,000 kg for each of the seven most frequently detected pesticides.
W83-03322

CHEMICAL EFFECTS OF SELECTED TRACE-METALS FROM SANITARY LANDFILL LEACHATES ON GROUNDWATER QUALITY,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 5E.
W83-03340

EFFECTS OF SURFACE APPLICATION OF DAIRY MANURE ON THE INFILTRATION RATE AND QUALITY OF SURFACE RUNOFF,
Kentucky Water Resources Research Inst., Lexington.
J. L. Tarab, I. J. Ross, J. D. Bottom, and B. J. Barfield.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222422, Price codes: A05 in paper copy, A01 in microfiche. Research Report No 138, June 1983. 86 p, 10 Fig, 18 Tab, 47 Ref, 1 Append. OWRT A-081-KY(1), 14-34-0001-0119, 14-34-0001-0119

Descriptors: *Agricultural runoff, *Animal wastes, *Manure, *Non-point pollution sources, Pollution load, Soil treatment, Kentucky, Dairy manure, Loam, *Infiltration rates, Nitrogen.

Dairy manure was surface spread on 12 ft x 12 ft plots on an established fescue pasture in the summer and fall of 1981 and 1982. The soil was a Murray silt loam. A simulated rainfall was applied to plots to test the effects of nitrogen rate (75, 150, and 300 No N/acre) time delay between manure application and the simulated rainfall events (o, 3, 6, 24, 48, 96 hours and 120 hour test repeated on 0 hr plot with 300 No N/acre), and type manure (semi-solid - 1981 and liquid - 1982) on the concentrations of pollutants in the surface runoff. The pollutants measured were COD, TSS, FSS, VSS, TS, FS, VS, NO sub 3, NH sub 4, N, P, and K. The simulated rainfall rates were 3.42 in/hr for 1981 and 4.02 for 1982. The average field infiltration rate for the non-manured test plots were 3.40 in/hr in 1981 and 4.42 in/hr in 1982. The infiltration rates of the manured plots were reduced by 5.8 to 15% for semi-solid manure and 23 to 31% for liquid manure for zero hour time delay plots. The infiltration rates increased to within 92% of the control plots after 120 hour time delay. The pollutant yields increased with nitrogen loading rate except for FSS yield which remained below the control plot yields. The N0 sub 3 yields was below the control plot except for 300 No N/acre plots. The reduction in pollutant yields with increased time delay was found to average 46 and 76% for the 24 and 48 hour time delays for semi-solid manure and 75 and 94% for liquid manure. The yields for TSS, FSS and VSS for liquid manure did not exceed the control after 48 hours.
W83-03344

THE ROLE OF FULVIC SUBSTANCES ON TRACE METAL PARTITIONING IN NATURAL AQUATIC SEDIMENTS,

Massachusetts Univ., Amherst. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W83-03348

WATER QUALITY OF AIRPORT STORM RUNOFF,
Hawaii Univ. at Manoa, Honolulu. Water Resources Research Center.
E. Christakos-Comack, and G. L. Dugan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-224170, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No 144, July 1982. 30 p, 5 Fig, 7 Tab, 22 Ref. OWRT A-086-HI(1), 14-34-0001-1113.

Descriptors: *Storm runoff, *Water supply, *Water quality standards, Water sampling, Pollutant identification, Heavy metals, *Hawaii, *Honolulu International Airport, *Nonpoint pollution sources.

The quality of natural and induced storm runoff was ascertained from the 11.33 x 10 super 6 m super 2 (2800 acre) Honolulu International Airport (daily average air traffic volume of about 1000 planes and a mean annual rainfall of approximately 508 mm (20 in.) by incorporating two monitoring schemes, the wet season and the dry season. The wet-season monitoring involved collecting storm runoff samples during and following rainfall events at established airport sites on paved surfaces. The dry-season monitoring scheme consisted of enclosing a 1.0-m super 2 (10.8-ft super 2) area, applying deionized water, and then collecting the wash water, leached chemicals, and sediments by a heavy-duty vacuum cleaner. Phenol, mercury, and turbidity exceeded the primary drinking water regulations, while pH, manganese, and total dissolved solids at times exceeded secondary drinking water regulations. Grease and oil concentrations showed a definite decrease from the Terminal Building (service and fueling area) to the outer drainage sites. High technology treatment, costing nearly four times the present cost of municipal water, would be required to meet potable water requirements; however, for subpotable use, an equalization basin could be constructed for one-half the cost of municipal water. The 1985 projected water demand volume could be met by recovered storm runoff.
W83-03353

HYDROLOGY OF AREA 14, EASTERN COAL PROVINCE, KENTUCKY,
Geological Survey, Louisville, KY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W83-03355

CHEMICAL-QUALITY RECONNAISSANCE OF THE WATER AND SURFICIAL BED MATERIAL IN THE DELAWARE RIVER ESTUARY AND ADJACENT NEW JERSEY TRIBUTARIES, 1980-81,
Geological Survey, Trenton, NJ. Water Resources Div.
For primary bibliographic entry see Field 2L.
W83-03363

PRODUCTION AND DECOMPOSITION OF FOREST LITTER FALL ON THE APALACHICOLA RIVER FLOOD PLAIN, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
J. F. Elder, and D. J. Cairns.
Available from Br. of Distr., USGS, 604 S. Pickett St., Alexandria, VA 22304, Price $5.50. Geological Survey Water-Supply Paper 2196-B, 1982. 42 p, 23 Fig, 10 Tab, 50 Ref.

Descriptors: *Decomposition, *Trees, *Leaves, *Organic matter, Flood plains, Wetbanks, Forest, Litter, Vegetation, Productivity, Cycling nutrients, Detritus, *Florida, Apalachicola River.

Measurements of litter fall (leaves and other particulate organic material) and leaf decomposition were made on the Apalachicola River flood plain in 1979-80. Litter fall was collected monthly in five different forest types in swamp and levee areas. Leaves from 42 species of trees and other plants accounted for 58% of total litter fall. The remaining 42% was nonleaf material. Average litter fall was 800 grams per square meter per year in the flood plain. Tupelo (Nyssa), baldcypress (Taxodium), and ash (Fraxinus), all swamp-adapted trees, produce over 50% of the leaf fall. Common levee species such as sweetgum (Liquidambar styraciflua) and diamond-leaf oak (Quercus laurifolia) are also major contributors to total flood-plain litter fall. Annual flooding of the river provides an important mechanism for mobilization of the litterfall products. Leaf decomposition rates were greatly reduced in dry environments. Carbon loss was nearly linear over a 6-month period, but nitrogen and phosphorus loss was exponential and nearly complete within 1 month. (USGS)
W83-03364

HYDROLOGIC CONDITIONS AT THE IDAHO NATIONAL ENGINEERING LABORATORY, IDAHO--EMPHASIS: 1974-1978,
Geological Survey, Idaho Falls, ID. Water Resources Div.
J. T. Barraclough, B. D. Lewis, and R. G. Jensen.
Available from Br. of Distr., USGS, 604 Pickett St., Alexandria, VA 22304, Price $4.75. Geological Survey Water-Supply Paper 2191, 1982. 52 p, 46 Fig, 4 Tab, 35 Ref.

Descriptors: *Water pollution sources, *Chemical wastes, *Radioactive wastes, *Water quality, Radioactive waste disposal, Groundwater, Aquifers, Observation wells, Groundwater recharge, Water level fluctuations, Path of pollutants, Infiltrations, Geohydrology, *Idaho, Idaho National Engineering Laboratory, Snake River Plain.

Aqueous chemical and radioactive wastes have been discharged to shallow ponds and to shallow or deep wells on the Idaho National Engineering Laboratory (INEL) since 1952 and has affected the quality of the groundwater in the underlying Snake River Plain aquifer. Ongoing studies conducted from 1974 through 1978 have shown the perpetuation of a perched ground-water zone in the basalt underlying the waste disposal ponds at the INEL's Test Reactor Area and of several waste plumes in the regional aquifer created by deep well disposal at the Idaho Chemical Processing Plant (ICPP). The perched zone contains tritium, chromium-51, cobalt-60, strontium-90, and several nonradioactive chemicals. Tritium has formed the largest waste plume south of the ICPP, and accounts for 95% of the total radioactivity disposed of through the ICPP disposal well. Waste plumes with similar configurations and flowpaths contain sodium chloride, and nitrate. Strontium-90, iodine-129, and cesium-137 are also discharged through the well but they are sorbed from solution as they move through the aquifer or are discharged in very small quantities. Strontium-90 and iodine-129 have formed small waste plumes and cesium-137 is not detectable in groundwater samples. Radionuclide plume size and concentrations therein are controlled by aquifer flow conditions, the quantity discharged, radioactive decay, sorption, dilution by dispersion, and perhaps other chemical reactions. Chemical wastes are subject to the same processes except for radioactive decay. (USGS)
W83-03365

ORGANICS TRANSPORTED THROUGH SELECTED GEOLOGIC MEDIA: ASSESSMENT OF ORGANICS TRANSPORTED AWAY FROM INDUSTRIAL WASTE DISPOSAL SITES,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5A.
W83-03375

FECAL COLIFORM RELEASE STUDIES AND DEVELOPMENT OF A PRELIMINARY NONPOINT SOURCE TRANSPORT MODEL FOR INDICATOR BACTERIA,
Utah State Univ., Logan.
E. P. Springer, G. F. Gifford, M. P. Windham, R. Thelin, and M. Kress.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-224253, Price codes: A06 in paper copy, A01 in microfiche. Utah Water Research Laboratory Hydraulics and Hydrology Series UWRL/H-83/02, Utah State Univ., Logan, April 1983. 108 p, 54 Fig, 34 Tab, 71 Ref. OWRT A-048-UTAH(1), 14-34-0001-0147.

Descriptors: Grazing, Cattle, Feces, *Bacteria, *Coliforms, *Animal wastes, Kinematic waves, Overland flow, Stochastic processes, *Non-point pollution sources, Model studies, Bioindicators, Path of pollutants, Rainfall intensity, Land use.

Grazing is a primary land use and one that creates significant volumes of animal waste and can pose a significant threat to water quality. This study combined laboratory work to derive a relationship quantifying the rate of release of coliforms from cattle fecal deposits and a general transport model describing indicator bacteria movement overland into channels. Experimental determination of a release function was based on rainfall simulated on standard cowpies and measured fecal coliform counts in the runoff. Peak coliform release rates were found to decline with age. Rainfall intensity had little effect on coliform release from new deposits but a deposit age of over 20 days, low intensity rains gave significantly higher counts. For modeling coliform movement, overland flow as modeled by kinematic routing, and bacterial transport was modeled with a random ordinary differential equation. Overall, the model did not do very well in predicting bacteria movement quantitatively. It did show that bacteria are moved long distances on smooth surfaces, but movement on soil surfaces was harder to represent, largely because the contribution from the fecal deposits tended to be small compared to other sources on erodable soil surfaces. If these high background counts are typical of natural conditions, grazing impacts are probably minimal.
W83-03376

RECOVERY AND TRANSPORT OF HEAVY METALS BY SPARTINA ALTERNIFLORA FROM DREDGING SPOILS,
Rhode Island Univ., Kingston. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 2L.
W83-03381

PHOTOINDUCED HYDROXYLATION REACTIONS OF ORGANIC CHEMICALS IN NATURAL WATERS, NITRATES AS POTENTIAL OH RADICAL SOURCES (PHOTOINDUZIERTE HYDROXYLIERUNGSREAKTIONEN ORGANISCHER CHEMIKALIEN IN NATURLICHEN GEWASSERN, NITRATE ALS POTENTIELLE OH-RADIKALQUELLEN),
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Neuherberg (Germany, F.R.). Inst. fuer Okologische Chemie.
H. Russi, D. Kotzias, and F. Korte.
Chemosphere, Vol 11, No 10, p 1041-1048, 1982. 2 Fig, 1 Tab, 10 Ref. English summary.

Descriptors: *Organic compounds, *Chemical reactions, Natural waters, *Nitrates, *Solar radiation, Humic acids, Nitrites, Aquatic environment, Free radicals, Hydroxyl radicals, Fate of pollutants, Degradation, Photolysis, Hydrolysis.

Organic chemicals are frequently encountered in natural waters, where they undergo complex reactions under the influence of solar radiation and are catalyzed by substances such as humic acid as well as nitrate and nitrite salts. Nitrates are present in high concentrations in natural waters (5-50 mg/liter). The photolysis of the nitrate ion leads to the formation of OH-radicals. Here the steady-state concentration of OH-radicals in different aquatic environments is estimated (about 5 times 10 to the -16th power mol/liter). It depends upon the amount of nitrate dissolved in the water. Under the conditions in this investigation, the half life for a great number of organic chemicals lies in the range 80-400 hours (for the reaction with OH-radicals). (Author's abstract)
W83-03385

STUDIES OF ACTIVATION PRODUCTS IN THE TERRESTRIAL ENVIRONMENTS OF THREE SWEDISH NUCLEAR POWER STATIONS,
Lund Univ. (Sweden). Dept. of Nuclear Physics.
T. Ingemansson, B. Erlandsson, and S. Mattsson.
Environmental Pollution, Series B, Vol 5, No 1, p 17-33, 1983. 5 Fig, 3 Tab, 14 Ref.

Descriptors: *Radioisotopes, *Indicators, *Nuclear powerplants, Cobalt radioisotopes, Zinc radioisotopes, Beryllium radioisotopes, Manganese radioisotopes, Sludge, Fate of pollutants, Powerplants, Simpevarp, Ringhals, Barseback, *Sweden, Air pollution, Vegetation, Lichens, Water pollution sources, Soil.

Sewage sludge collected weekly over 8 months at treatment plants in the vicinity of three Swedish nuclear power stations at Simpevarp, Ringhals, and Barseback were sensitive indicators of radioactive products released into the air. Radionuclides in sludge and in reported controlled releases from the power stations to the air were in the following sequences of decreasing activity concentration: Co60 > Zn65 > Co58 = Mn54. Reported releases of radioactive products to the air were reflected by subsequent increases of radioactive products in sludge. The time variation of activity concentration was reflected better in sludge sedimented from incoming wastewater than in digested sludge from the final treatment phases. The Co58/Co60 activity ratio in sludge was similar to that in releases to the air. Although levels of radionuclides originating in hospitals (Se75 and I131) were unaffected by rainfall, Co60 activity concentrations rose from nondetectable to 55 Bq per kg with the first rain runoff that reached the sewage plant, and then rapidly decreased. Co58 and Co60 levels were much higher in soil than in overlying lichen carpet, whereas Zn65 and Be7 levels were much higher in lichen than in soil. The radionuclide which produced the highest activity concentration in surface air samples was Be7. The Zn65/Co60 activity ratios in sludge and in reported releases to the air and to water were of the same order of magnitude for the three areas studied. This indicates the similar fate of Co60 and Zn65 between reactor and sewage plant. (Cassar-FRC)
W83-03397

CONCENTRATION, REACTIVITY AND FATE OF COPPER, NICKEL, AND ZINC ASSOCIATED WITH A COOLING-WATER PLUME IN ESTUARINE WATERS, II. THE PARTICULATE PHASE,
Connecticut Univ., Groton. Marine Sciences Inst.
D. Waslenchuk.
Environmental Pollution, Series B, Vol 5, No 1, p 59-70, 1983. 3 Fig, 2 Tab, 4 Ref.

Descriptors: *Cooling water, *Particulate matter, *Metals, Fate of pollutants, Copper, Nickel, Zinc, Plumes, Estuaries, *Long Island Sound, Millstone Nuclear Power Plant, Waterford, Connecticut, Powerplants, Corrosion, Suspended,solids, Heavy metals.

Concentrations of particulate phases of metals were studied at 23 stations in Long Island Sound, which receives cooling water discharges from the Millstone Nuclear Power Plant, Waterford, Connecticut. Particulate nickel levels were, for the most part, below the detectable limit. Copper levels (ng per mg) of particulate matter in the water were 6.45 to 19.9 at the intakes, 97.0 at the outlet, 14.6-69.7 in the plume, and 6.3-16.5 at far-field stations. Zinc levels (ng per mg) were 22.7-89.1 at the intakes, 117.5 at the outlet, 37.2-75.0 in the plume, and 39.7-79.5 at far-field stations. Total suspended solids (mg per liter) were 2.73-7.06 at the intakes, 5.35 at the outlet, 3.68-8.67 in the plume and 3.60-6.94 at the far-field stations. Electron microprobe dispersive X-ray analysis showed that the enriched particulates were not metal or oxide flakes from the condenser tubes; rather, grains coated with oxhydroxides or carbonates. The particulate metals concentrations decreased more rapidly in the plume than predicted from temperature dilution. This indicated a repartioning between dissolved and particulate phases, which resulted in excess dissolved copper and zinc in the plume, as confirmed by an earlier study. (Cassar-FRC)
W83-03398

LEAD AND OTHER TRACE METALS IN THE SEDIMENTS AND SELECTED BIOTA OF PRINCESS ROYAL HARBOUR, ALBANY, WESTERN AUSTRALIA,
Western Australia Dept. of Conservation and Environment, Perth.
V. Talbot.
Environmental Pollution, Series B, Vol 5, No 1, p 35-49, 1983. 1 Fig, 4 Tab, 10 Ref.

Descriptors: *Metals, *Lead, *Shellfish, Fate of pollutants, Water pollution sources, Princess Royal Harbor, Albany, *Australia, Heavy metals, Mollusks, Industrial wastes, Sediments, Marine sediments, Phosphates.

Sediment samples and shellfish were collected at 15 sites in Princess Royal Harbor, Albany, Australia, in February 1981 to determine levels of 10 heavy metals (Ag, Cd, Cr, Co, Cu, Fe, Mn, Ni, Pb, and Zn). Elevated levels of metals and organic matter were found in sediments from sites in the vicinity of wharves and food processors. Sources of pollutants were phosphate fertilizer and sulfur spills, antifouling paints, and stormwater runoff from a lead battery processor plant. However, filter-feeding mollusks at these sites contained low levels of metals. In the western part of the harbor, impacted by a superphosphate plant, Pb and F levels exceeded health standards in some mollusk samples. Pb levels in sediments from the western area were in the background range. These results point out the different fates of metals in the same water body. In one case the heavy metals were quickly adsorbed by the sediments and did not contaminate the shellfish. In the western basin the metals were accumulated by the shellfish and did not reach the sediments in significant quantities. It was suggested that the geometric rather than the arithmetric mean should be used to represent heavy metal data in cockles. (Cassar-FRC)
W83-03399

INDUSTRIAL EFFLUENTS AS A SOURCE OF MERCURY CONTAMINATION IN TERRESTRIAL RIPARIAN VERTEBRATES,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
G. V. N. Powell.
Environmental Pollution, Series B, Vol 5, No 1, p 51-57, 1983. 2 Tab, 28 Ref.

Descriptors: *Mercury, *Food chains, *Birds, Fate of pollutants, Bats, Holston River, *Virginia, Aquatic insects, Insects, Industrial wastes.

Mercury levels in the tissues of birds and bats collected in the summer of 1978 from the North Fork of the Holston River, Virginia, were elevated. A 185 km reach of the river has been contaminated by wastes from a chlor-alkali factory which, from 1954 to 1972, discharged up to 50 kg of mercury per day into the river, plant grounds, and 50 ha of settling ponds. Insectivorous and piscivorous species included green heron, mallard duck, wood duck, rough-winged swallow, eastern phoebe, Louisiana water thrush, red-winged blackbird, song sparrow, and eastern pipistrelle (bat). Mean Hg levels (ppm wet weight) were: 0.05-2.10 in control animals and 0.58-11.40 in animals collected in the contaminated area. Hg levels in aquatic insects were: 0.01-0.2 ppm in control insects and 0.1-2.5 ppm in insects from the contaminated area. These results illustrate the spread of Hg pollutants from one ecosystem to another. (Cassar-FRC)
W83-03402

PRIORITY POLLUTANTS IN MUNICIPAL SEWAGE SLUDGE, PART II,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5E.
W83-03406

DEVELOPMENTS, RECOMMENDATIONS AND APPLICATIONS OF TESTS FOR EVALUATING THE CHEMICAL STABILITY OF HIGH-LEVEL RADIOACTIVE SOLID WASTE FORMS,
North Carolina State Univ. at Raleigh. School of Engineering.
A. G. Solomah.
Environmental Pollution, Series B, Vol 5, No 1, p 9-16, 1983. 2 Fig, 1 Tab, 13 Ref.

Descriptors: *Radioactive wastes, *Hydrogen ion concentration, *Leaching, Fate of pollutants, Waste disposal, Chemical reactions, Solid wastes, Underground waste disposal, Monitoring.

Two factors important in the study of leaching of high-level radioactive wastes buried deep in the ground are: (1) the pH behavior of the leaching medium, and (2) the fractional release of radioactivity to the environment. Several problems associated with pH measurement include variations in temperature, pressure, and carbon dioxide content in the leaching substance (e.g. groundwater). To correct for these conditions it is desirable to use reference solutions, to keep the ratio between volume of solution and inner surface of the container the same in all experiments, and to compensate for temperature and time effects for long leach periods, reaching several years. A plot of the fractional release of a specific element as a function of leaching time can clearly show the leaching behavior of a solid waste under different conditions. (Cassar-FRC)
W83-03427

TRIHALOMETHANE REMOVAL AND FORMATION MECHANISM IN WATER,
Howard Univ., Washington, DC Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5F.
W83-03430

CHEMICAL SPECIATION OF LEACHATES FROM WASTE DISPOSAL SITES,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
G. L. Mullins, and L. E. Sommers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-224469, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No 158, March 1983. 39 p, 13 Tab, 8 Ref. OWRT A-066-IND(1).

Descriptors: *Leachates, Wastewater, *Wastewater disposal, *Land disposal, Speciation, Inorganic chemicals, Trace metals, Borate complexes, Soils, Groundwater.

Data were obtained from the literature on the fate of inorganic components applied to soils during wastewater irrigation. The chemical composition of wastewater applied and of soil leachates and groundwaters irrigated with wastewater was obtained for six locations in the U.S.; leachate data were also obtained for landfill test cells. Total analytical data for metals and ligands were used as input for an equilibrium chemical model (GEOCHEM) to evaluate metal-ligand species present in the original wastewater and the leachates. The results indicate that wastewaters and leachates contain sodium and potassium as the free metal ion while inorganic complexes with sulfate, phosphate or carbonate are predominant species for calcium and magnesium. The speciation of trace metals was very dependent on the concentration or organic carbon in the solution along with the amounts of inorganic ligands such as borate and phosphate. This study revealed that borate complexes of trace metals (nickel, cadmium, lead, zinc) could be important soluble species in many calcareous soils and groundwaters. Trace metals in the majority of wastewaters and leachates were undersaturated with respect to major solid phases.
W83-03432

ORGANIC MATTER POLLUTION OF GROUNDWATER NEAR HIGHWAYS (BELASTUNG DES GRUNDWASSERS MIT ORGANISCHEN STOFFEN IM GEBIET VON STRASSEN),

Group 5B—Sources Of Pollution

Hessisches Landesamt fuer Bodenforschung, Wiesbaden (Germany, F.R.).
A. Golwer, and W. Schneider.
Gas- und Wasserfach: Wasser/Abwasser, Vol 123, No 7, p 329-342, July, 1982. 2 Fig, 10 Tab, 25 Ref. English abstract.

Descriptors: *Groundwater, Water quality, *Water pollution sources, *Organic compounds, Roads, *Highways, Drainage, Infiltration, Vegetation, Microorganisms, Degradation, Water supply, Fate of pollutants.

Studies were undertaken to determine the influence of organic substances originating from road traffic on the quality of underground water supplies. Three organic parameters, 32 organic group parameters and individual compounds, and an additional 25 selected inorganic major, minor and trace components were determined innumberous water and sludge samples. Road-specific organic pollutants included compounds extractable with petroleum ether or carbon tetrachloride, some volatile aliphatic and aromatic hydrocarbons, polycyclic aromatic hydrocarbons, phenols, anionic surfactants and total cyanides. The organic substances from roads do not spread as far underground as inorganic substances because they are not only diluted, sorbed and partly retained by mechanical filtration on the surface and during underground passage, but they are also degraded by microorganisms. The vegetation of the ground is therefore of decisive importance for protecting groundwater from organic pollution. The study suggests that safety precautions in the area of the study to protect groundwater from drainage of roads may be less extensive than those required in Germany at present. (Baker-FRC)
W83-03446

HEAVY METALS IN FLOWING WATERS AND RIVER SEDIMENTS OF THE WESTERN HARZ REGION (SCHWERMETALLE IN DEN FLIESSGEWASSERN UND FLUSSSEDIMENTEN DES WEST-HARZES,
Thessaloniki Univ., Salonika (Greece). Pollution Control Lab.
K. Fytianos.
Gas- und Wasserfach: Wasser/Abwasser, Vol 123, No 4, p 194-198, April, 1982. 3 Fig, 4 Tab, 11 Ref. English abstract.

Descriptors: *Rivers, *Heavy metals, *Industrial wastes, *Sediments, *Water sampling, Sampling, Water pollution, Water Pollution sources, Lead, Zinc, Copper, Manganese, Nickel, Iron, Atomic absorption spectroscopy, Spectroscopy, X-ray spectroscopy, Harz mountains, Innerste River, Sose River, Sieber River, Federal Repubic of Germany.

The concentration of heavy metals was determined at 21 sites in three rivers of the Harz Mountain area of Northern Germany (Innerste, Sose, and Sieber) during 1978-1979. Also, the heavy metal content of sediments was determined at 11 of the sampling locations. Lead, zinc, copper, manganese, nickel and iron content were determined by X-ray spectrometry, and mercury and cadmium content were determined in sediments using atomic absorptionspectrometry. A direct relationship between suspended metal content and effluent metal content was not found, and only a slight relationship between some metal concentrations and amounts of effluents was indicated. Lead was found rarely, and then in combination with other elements. Zinc was fairly common and did not occcur in combination with other elements. These two metals seem to have different transport mechanisms in water. Levels of copper, nickel and lead were fairly consistent through the test area, while amounts of zinc, iron, and manganese varied widely and seemed dependent on the amounts of industrial wastes. The highest levels of metals were found in the Innerste River water and sediment. In sediment, the relative levels in the Innerste were Pb > Cu, Fe > Zn > Ni > Mn. (Small-FRC)
W83-03457

TRACE ELEMENTS (MANGANESE, ZINC AND COPPER) IN THE USSR PART OF THE DANUBE RIVER,
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
Y. P. Nakhshina, L. A. Malinovskaya, I. B. Zubenko, and G. I. Strokatenko.
Hydrobiological Journal, Vol 18, No 1, p 92-96, 1982. 2 Fig, 1 Tab, 10 Ref.

Descriptors: *Metals, *Trace metals, *Suspended solids, Rivers, Heavy metals, Manganese, Zinc, Copper, Fate of pollutants, Danube River, *USSR, Black Sea Basin.

Concentrations of dissolved metals in the water of the Soviet segment of the Danube River were surveyed in 1975 and 1977-79. These were (in micrograms per liter): Mn, 0-70; Zn, 3-100; and Cu, 5-59. Zn and Cu reached seasonal peaks in winter and minima in spring and fall and dropped somewhat over the 90 km segment from the Prut mouth to the Ochakov branch of the delta. Suspended matter contained 87-100% of the total Mn, 57-95% of the total Zn, and 40-85% of the total Cu. In 1965 levels of dissolved metals (in micrograms per liter) in the Black Sea Basin rivers were lower: Mn, 0-70; Cu, 0.3-20.1; and Zn, 3.1-43.0. The increase is attributed to increasing contamination by man-made wastes. (Cassar-FRC)
W83-03470

DRINKING WATER CONTAMINATION WITH CHLORO-ORGANIC COMPOUNDS: SOURCES, HEALTH EFFECTS, CONTROL (CONTAMINAZIONE DELLE ACQUE POTABILI DA COMPOSTI CLORO-ORGANICI: ORIGINE, EFFETTI BIOLOGICI, MISURE DI PROTEZIONE E DI CONTROLLO),
Milan Univ. (Italy). Inst. of Hygiene.
For primary bibliographic entry see Field 5F.
W83-03476

MACRO AND TRACE-ELEMENTS IN DRINKING WATER AND FOODS. PART 2 (MACRO ED OLIGOELEMENTI NELL'APPORTO IDRICO ED ALIMENTARE. NOTA 2),
M. G. Pellegrini, M. Cocchioni, R. Riccioni, and F. Tarantini.
Igiene Moderna, Vol 76, No 3, p 483-508, September, 1981, 10 Fig , 4 Tab, 1 Ref. English summary.

Descriptors: *Drinking water, *Trace elements, *Water pollution sources, *Foods, *Water quality, Water pollution, Water analysis, Cadmium, Magnesium, Chromium, Calcium, Cobalt, Copper, Zinc, Lead, Nickel, Maganese, *Italy, Industrial wastes, Chemical analysis, Marches region.

The results of systematic dose-sampling of some macro and trace-elements (Ca, Mg, Cr, Cd, Co, Cu, Zn, Pb, Ni, and Mn) in drinking water in the Marches region of Italy are presented and discussed. The concentrations of these elements in all of the communes considered were below the limits set by the World Health Organization. In Pesaro and Ancona provinces the highest concentrations and most extreme variations were found due to the greater industrial development of these areas. The significance of the role of food for organisms which contain the elements is stressed. The quantities ingested with drinking water represent a low percentage when compared to quantities ingested with foodstuffs, but adsorption from drinking water is much higher than adsorption from food. Determining which elements are ingested and at what quantities is important as well as determining the quantitative relationships between elements and thus mineral imbalances. Correlations between element ingestion and chronic diseases are being studied. (Author's abstract)
W83-03483

VIRAL CONTAMINATION OF SEAWATER AT MESSINA (INQUINAMENTO DI NATURA VIRALE DELLE ACQUE DI MARE DELLA CITTA'DI MESSINA),
Messina Univ. (Italy). Ist. di Igiene.
O. C. Grillo, F. Munao, V. Ciano, I. Picerno, and A. Di Pietro.
Igiene Moderna, Vol 77, No 2, p 228-241, 1982. 1 Fig, 4 Tab, 35 Ref. English summary.

Descriptors: *Viruses, *Feces, *Outfall sewers, *Water analysis, *Mussels, Water pollution sources, Municipal wastes, Urban areas, Seasonal variation, Messina, Ganzirri Lake, *Italy, Lakes.

Virus pollution affects seawater, especially around those urban communities where wastewater is not treated. All of the viruses present in fecal matter are present in untreated sewage. Viruses present in the sewage discharged by the four main sewer outfalls in Messina were investigated. Also, water samples were collected at three sites in Ganzirri Lake where mussels are grown. Insoluble polyelectrolytes, used as coadjuvant in flocculation with aluminum hydroxide, were employed to concentrate the viruses. Virus agents were found at all sampling sites. Thirty-seven viruses were isolated; 16 were polioviruses, 16 were adenoviruses, and 5 could not be identified. Viruses were most prevalent in the spring. Virus pollution of water is significant near the urban area of Messina. The presence of viruses in the lake is particularly dangerous for public health because of the high filtering and concentrating power of mussels. No significant correlation was found between virus and bacterial contamination indicators. (Author's abstract)
W83-03484

5C. Effects Of Pollution

BUFFER CAPACITIES OF FRESH WATER LAKES SENSITIVE TO ACID RAIN DEPOSITION,
Rutgers - The State Univ., New Brunswick, NJ. Center for Coastal and Environmental Studies.
For primary bibliographic entry see Field 2H.
W83-03171

EFFECTS OF SIMULATED ACID RAIN ON YIELDS OF RAPHANUS SATIVUS, LACTUCA SATIVA, TRITICUM AESTIVUM AND MEDICAGO SATIVA,
Brookhaven National Lab., Upton, NY.
L. S. Evans, N. F. Gmur, and D. Mancini.
Environmental and Experimental Botany, Vol 22, No 4, p 445-453, 1982. 2 Fig, 7 Tab, 22 Ref.

Descriptors: *Acid rain, *Crop yield, *Toxicity, Wheat, Alfalfa, Radish, Lettuce, Plant growth, Growth, Inhibition, Water pollution effects.

The effects of simulated acidic rain were determined on several crops grown under greenhouse conditions. Plants were radishes (Raphanus sativus), lettuce (Lactuca sativa), wheat (Triticum aestivum), and alfalfa (Medicago sativa). Simulated rainfalls of pH 5.6, 4.6, 4.2, 3.4, 3.0, and 2.6 decreased root yields of radishes by 26, 42, 37, 41, 66, and 73%, respectively, compared with controls. Similar reductions were seen in radish shoot fresh mass, leaf area, and root diameter. The efficiency of radish foliage in increasing root mass decreased with increased acidity. Lettuce yields (fresh mass) were 11, 10, and 14% less than controls for plants exposed to rainfall of pH 4.0, 3.1, and 2.7, respectively. Rain water of pH 5.7 produced some foliar injury on the outer leaves of lettuce but did not affect marketable quality or yield. Yields of wheat exposed to 46 rainfalls with pH as low as 2.7 during anthesis and caryopsis development were unaffected. Alfalfa showed no differences in fresh mass among treatments even after 57 simulated rainfalls of pH 2.7 water over 105 days. (Cassar-FRC)
W83-03195

TUFA PRECIPITATION AND ITS EFFECT ON DRAINAGE OF INTERSTATE HIGHWAYS IN NORTHEASTERN OHIO,
Kent State Univ., OH. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W83-03213

ECOLOGICAL ASSESSMENT OF WATER QUALITY: COMPARISON OF BIOLOGICAL-ECOLOGICAL PROCEDURES IN A RAIN-FED LOWLAND WATERWAY (KLEINE NETE, N. BELGIUM),

Antwerp Univ., Wilrijk (Belgium). Dept. of Chemistry.
A. Vandelannoote, G. De Gueldre, and B. Bruylants.
Hydrobiological Bulletin, Vol 15, No 3, p 161-164, December, 1981. 1 Tab, 9 Ref.

Descriptors: *Biological properties, *Invertebrates, *Water quality, Benthic fauna, Aquatic life, Streams, Ecology, Kleine Nete River, *Beligium, Water pollution effects, Pollution index.

The correlation between physicochemical water quality parameters and invertebrate populations was determined from 58 samples collected in April and September 1977 and April 1978 from 23 brooks in the Kleine Nete River Basin, Belgium, a rainfed lowland waterway with extreme variations in flow. The Gardeniers-Tolkamp (1976) indexes, based on the Moller Pillot (1971) saprobic system, were most suitable for assessing organic water quality of the brooks under study. The Woodiwiss (1964) and Tuffery-Verneaux (1968) biotic indexes were unsuitable because of overestimation of water quality at low flow and underestimation in oligothrophic and slightly polluted reaches. The variety indexes of Margalef, Menhinick, and Odum-Cantlon-Kornicker were not applicable for assessment of biological water quality for similar reasons. (Cassar-FRC)
W83-03214

THE INFLUENCE OF MICRO-ALGAE ON THE OXYGEN DYNAMICS IN A BRACKISH DITCH,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
J. W. Rijstenbil, and A. G. A. Merks.
Hydrobiological Bulletin, Vol 15, No 3, p 123-135, December, 1981. 13 Fig, 5 Tab, 23 Ref.

Descriptors: *Oxygen, *Algae, *Seasonal variation, Dissolved oxygen, Ditches, Brackish water, Saline water, Adriaan Polder, *Netherlands, Photosynthesis, Diurnal variation, Chlorophyll. Benthic flora, Phytoplankton, Migration, Ice cover.

Seasonal changes in phytoplankton and benthic algae activity relative to diurnal oxygen changes were studied in a 120 cm deep, 12 m wide drainage ditch in Adriaan Polder, the Netherlands, a brackish, hypertrophic ditch. Oxygen gradients were unstable, depending on the chloride gradient and wind velocity. In summer diatoms produced surface oxygen maxima at light saturation in late afternoon. At the same time flagellates produced oxygen in dim light, choosing their suitable light conditions by vertical migration. Oxygen levels fluctuated from 0 to 34 mg per liter in a 100 cm vertical profile above a 20 cm anoxic layer. The widest range of diurnal fluctuations in oxygen concentration maxima was seen in summer, 10 to 34 mg per liter. In winter only about 6-8% of surface light energy reached the bottom. In daytime the oxygen gradient was reversed because benthic algae produced oxygen on the bottom. About noon 1 mg per liter per hour of oxygen was produced in a 10 cm water layer above the bottom. Vertical oxygen transport appeared to be blocked below 60 m over the sediment. (Cassar-FRC)
W83-03215

SALINE SEEPAGE AND VERTICAL DISTRIBUTION OF OXYGEN IN A BRACKISH DITCH,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
A. G. A. Merks, and J. W. Rijstenbil.
Hydrobiological Bulletin, Vol 15, No 3, p 111-121, December, 1981. 16 Fig, 11 Ref.

Descriptors: *Seepage, *Oxygen demand, *Anaerobic conditions, Ditches, Fate of pollutants, Brackish water, Polders, Drainage ditches, Saline water, Dissolved oxygen, Lake Veere, Adriaan Polder, *Netherlands, Chlorides, Bottom sediments, Stratification, Algae, Water quality control.

Saline seepage into drainage ditches and its effects on oxygen concentrations were studied in the laboratory and in a 120 cm deep, 12 m wide ditch in the Adriaan Polder near Lake Veere, the Netherlands. In summer when the level of Lake Veere was raised by 70 cm, seepage into the ditch 6-10 mm per hour was observed. The seepage contained chlorides, sulfides, and manganese and ferrous ions, forming a vertical oxygen gradient and an anoxic layer. Bottom oxygen demand was 2.0 g 02 per sq m per hour. During winter when the lake level was lowered, seepage stopped, and chloride entered the water by diffusion from the mud, which decreased in chlorinity from 15 to 3 o/oo. When the ditch level sank below the lake level for short periods during this season, seepage immediately restored the chlorinity in the ditch. Oxygen requirements were 1.42 g 02 per sq m per hour. In the laboratory simulations a seepage velocity of 1mm per hour corresponded with an oxygen demand of 0.05 g per sq m per hour. Extremely fast seepage caused a bottom oxygen uptake that exceeded the algal oxygen production. The bottom oxygen demand then reached a maximum when the dissolved oxygen was depleted. To prevent seepage and anoxic conditions the lake should be maintained below the ditch level in summer as well as in winter. (Cassar-FRC)
W83-03216

FISH FARM EFFLUENTS--CAUSE FOR CONCERN,
For primary bibliographic entry see Field 5B.
W83-03237

THE RESPONSES OF PLANKTON COMMUNITIES IN EXPERIMENTAL PONDS TO ATRAZINE, THE MOST HEAVILY USED PESTICIDE IN THE UNITED STATES,
Kansas Univ., Lawrence. Dept. of Systematics and Ecology.
F. DeNoyelles, W. D. Kettle, and D. E. Sinn.
Ecology, Vol 63, No 5, p 1285-1293, 1982. 2 Fig, 4 Tab, 36 Ref. OWRT A-092-KAN.

Descriptors: *Plankton, *Water pollution effects, *Pesticides, Organic compounds, Agricultural chemicals, *Atrazine, Population dynamics, Ponds, Photosynthesis, Phytoplankton, Zooplankton, Kansas.

Experimental ponds received single additions of atrazine in concentrations of 20 and 500 micrograms/liter, and were compared to control ponds for 136 days. Atrazine at each concentration depressed phytoplankton growth in the ponds within a few days. This was followed by successional changes leading to the establishment of species of phytoplankton more resistant to inhibition by atrazine. Laboratory studies verified this resistance and verified effects on other species at concentrations of atrazine as low as 1 to 5 micrograms/liter. At the concentration of 500 micrograms/liter there was a delayed appearance but eventually a greater biomass and persistence of resistant species than at lower concentrations. Natural interactions such as competition and predation among the species of the communities greatly affected their responses to the toxic chemical. The importance of atrazine as an environmental pollutant is suggested by these responses to concentrations of 1 to 5 microgram/liter, which are commonly found downstream from agricultural lands, and 20 micrograms/liter, which is the highest level usually found in such waters. The level of 500 micrograms/liter is found in waters directly adjacent to treated field. (Baker-FRC)
W83-03255

STUDY OF THE CHANGES IN RIVER WATER QUALITY (ETUDE DE L'EVOLUTION DE LA QUALITE DES EAUX DE RIVIERE),
Montpellier-2 Univ. (France). Lab. d'Hydrologie Mathematique.
For primary bibliographic entry see Field 5B.
W83-03267

AN EXPERIMENTAL INVESTIGATION OF THE EFFECTS OF CRUDE OIL ON TWO FRESHWATER LAKE ECOSYSTEMS,
Utah Water Research Lab., Logan.
M. D. Werner, V. D. Adams, and V. A. Lamarra.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-219774, Price codes: A10 in paper copy, A01 in microfiche. Utah Water Research Laboratory Water Quality Series UWRL/Q-83/04, April 1983. 218 p, 49 Fig, 41 Tab, 173 Ref, 12 Append. OWRT B-187-UTAH(1), 14-34-0001-0253.

Descriptors: Lakes, *Ogliotrophic lakes, Lake sediments, *Oil pollution, Oil, Oil spills, Microcosms, Nutrient immobilization, *Ecosystems litter, *Aquatic environment, Aquatic habitats, Wind, Biochemical oxygen demand, Decomposition, Utah, Idaho, Wyoming, Lake ecosystems.

The responses of two freshwater lake ecosystems (Bear Lake, Utah-Idaho, and New Fork Lake, Wyoming) to crude oil impaction were investigated in two phases. The effects were first studied on three phase (gaseous-aqueous-sediment) laboratory microcosms. Notable responses were increased oxygen demand, nutrient immobilization, reduction in plant biomass accumulation, and a heterotrophically dominated ecosystem. The increased availability of biologically degradable carbon (the oil) and nutrient immobilization dominated any toxic effects as the primary contributors to a long-term imbalance between autotrophs and heterotrophs. The second phase investigated the effects of crude oil on plant litter decomposition in the lakes. In general, crude oil reduced in situ litter decomposition, but as an annual average the activity of oil-litter associated decomposer communities was enhanced. Differences in impacts between litter types and lakes were explained by differences in biochemical structures of the plants, sediment types of the lakes, and wind over the lakes. Increased rates of oxygen utilization induced by the crude oil were identified as the potential primary detrimental effect of oil pollution. Crude oil did not affect the nutrient content of plant litter, but the rate of nutrient loss was reduced. Nitrogen limitation may have been the primary factor reducing the rate of oiled litter decomposition.
W83-03273

A STUDY OF EUTROPHICATION AND AQUATIC PLANTS GROWTHS IN SELECTED LAKES AND RIVERS OF PUERTO RICO,
Puerto Rico Univ., Mayaguez. Quality Control Lab.
E. Negron.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220376, Price codes: A03 in paper copy, A01 in microfiche. Puerto Rico Water Resources Research Institute Completion Report, Univ. of Puerto Rico, Mayaguez, March 1983. 24 p, 12 Tab, 11 Ref. OWRT A-071-PR(1), 14-34-0001-1141.

Descriptors: *Eutrophication, *Lakes, Aquatic plants, Nutrients, Sediments, *Puerto Rico, Rivers, *Aquatic plant growth, Cations, Nitrogen, Phosphorus, Reservoirs.

This study was conducted to identify the physical and chemical parameters which promote eutrophication and aquatic plants growths in the lakes of Puerto Rico. Five lakes were considered, all of them man-made reservoirs. The results showed that lakes with visible states of eutrophy had a cation ratio between 0.74 and 1.45, whereas those with no visible state of eutrophy had a cation ratio of 0.15-0.35. Nutrient enrichment was present in the eutrophic lakes, and all the sediments were enriched with nitrogen and phosphorus. The nitrogen was present in the organic form rather than as ammonia compounds. (Munoz, Puerto Rico).
W83-03300

EFFECTS OF COAL PILE RUNOFF ON STREAM QUALITY AND MACRO-INVERTEBRATE COMMUNITIES,
Maryland Univ., Frostburg. Appalachian Environmental Lab.
M. C. Swift.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220541, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Center Technical Report No 68, Univ. of Maryland, College Park,

September 1982. 50 p, 1 Fig, 13 Tab, 21 Ref, 2 Append. OWRT A-062-MD(1), 14-34-0001-2122.

Descriptors: *Coal pile leachate, Coal drainage, Water pollution effects, *Maryland, Georges Creek, *Mine drainage, Benthos, *Leachate, Coal pile runoff, *Pollutant identification, Water analysis, Invertebrates.

Samples of coal pile runoff and Georges Creek water and macrobenthos above and below two coal storage areas along Georges Creek, Allegheny County, Maryland, were collected during summer, fall and winter, 1982-1983. Coal pile runoff was collected under high and low flow conditions. Water samples were analyzed for Hg, Zn, As, Fe, Mn, Al, SO super -2 sub 4, pH, filterable and nonfilterable residue, conductivity and acidity. Leachate from coal piles along Georges Creek contains high concentrations of heavy metals, particularly manganese, aluminum, and zinc. Iron and sulfate are very high and the pH ranges from 1.4 to 3.1. Because of dilution, Georges Creek water has much lower concentrations of metals, iron and sulfate and a pH of about 7.0. The distribution of macrobenthos in Georges Creek shows the effects of both runoff from coal storage piles and periodic drought. Brillouin's diversity index values were low even in areas which did not dry up. Densities of tubificid worms and chironomid larvae were very high above the coal storage areas where organic inputs were high. At all the rest of the sampling stations, macroinvertebrate densities were very low. Where coal pile runoff enters Georges Creek, it compounds the effects of periodic drought and further stresses the aquatic community.
W83-03307

RADON-222 IN POTABLE WATER SUPPLIES IN MAINE: THE GEOLOGY, HYDROLOGY, PHYSICS AND HEALTH EFFECTS,
Maine Univ. at Orono. Land and Water Resources Center.
For primary bibliographic entry see Field 2K.
W83-03308

THE BIOLOGICAL REGULATION OF BLOOM-CAUSING BLUE-GREEN ALGAE: A FEASIBLE ALTERNATIVE,
Nebraska Univ., Lincoln. School of Life Sciences.
E. L. Martin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220574, Price codes: A03 in paper copy, A01 in microfiche. Nebraska Water Resources Center Completion Report, Univ. of Nebraska, Lincoln June 1982. 36 p, 11 Fig, 4 Tab, 46 Ref. OWRT A-056-NEB(1), 14-31-0001-9029.

Descriptors: *Cyanophyta, *Eutrophication, *Algal control, Bacteriophage, Biocontrol, Bacteria, Water quality, Aquatic microbiology, *Nebraska, Oscillatoria, Microcystis, Anabaena, Aphanizomenon.

The Army Corps of Engineers has constructed a group of flood control lakes in eastern Nebraska. Frequently, these lakes receive large amounts of inorganic nutrients (e.g., nitrates, phosphates) from runoff waters containing such agricultural materials as fertilizers and animal wastes. In the summer and early fall, these nutrients often cause a tremendous increase in water productivity exemplified by large blooms involving predominantly the blue-green algae strains Oscillatoria, Microcystis, Anabaena and Aphanizomenon. The initial focus of the project involved isolation and characterization of the bloom-forming strains of blue-green algae. Closely related to this was the isolation and characterization of appropriate biological regulatory agents (bacteria and viruses). Considerable effort was additionally spent on elucidating how the biological regulatory agents were able to specifically destroy their blue-green algal hosts. Laboratory microcosm studies were run in which the various biological control agents were able to rapidly lyse small 'blooms' (e.g. 1 and 2 liters) of the respective blue-green algal strains. These experiments were then extended to field trials in selected lakes (Pawnee and Twin Lakes) in the Salt Valley Watershed. Enclosures containing about 20 gallons were erected in the water near the shore. Some success was attained by our biological control agents in lysing both real and simulated blue-green algal blooms.
W83-03311

THE EFFECT OF HORMONAL POLLUTANTS ON AQUATIC CRUSTACEA AND THE SURROUNDING ENVIRONMENT,
Connecticut Univ., Storrs. Inst. of Water Resources.
H. Laufer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220582, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, December 1982. 38 p, 12 Fig, 5 Tab, 9 Ref. OWRT A-083-CONN(1), 14-34-0001-9007.

Descriptors: Pesticides, *Insecticides, *Insect control, Aquatic insects, *Arthropods, *Insect growth regulations, Carcinus meanas, *Hepatopancreas, Water pollution sources, Water pollution effects.

The impact of administering compounds which have hormonal activity on insects was evaluated on crustacea. The Juvenile Hormone Analog (JHA) Methoprene and its formulation, Altosid, were tested as were other compounds with specific insecticidal effects, such as Insect Growth Regulators (IGRs). Lethal levels of Methoprene (Altosid) were established. Sublethal levels affect reproduction and embryonic development. Safe concentrations of Methoprene and Precocene were found. Dimilin was more toxic to Daphnia than to target insects (1X10 super -9M). The results suggest that applications of specific IGRs to the environment could upset the biological food chain and thereby result in major pollution problems as well as the destruction of an aquatic ecosystem. The information should warn users of IGRs of potential hazards to an aquatic ecosystem. To provide new means for studying aspects of crustacean reproduction and its control, we have initiated short term organ culture procedures. Conditions for cultivating fragments of Carcinus meanas hepatopancreas were established. This tissue is capable of synthesizing yolk protein precursors, vitellogenins. Interstitial cells of the hepatopancreas were identified as the source of vitellogenins by the use of immunocytological localization. The production of yolk proteins seems to be hormonally regulated and sensitive to IGRs.
W83-03314

EFFECTS OF SEWAGE POLLUTION IN THE WHITE RIVER, ARKANSAS ON BENTHOS AND LEAF DETRITUS DECOMPOSITION,
Arkansas Univ., Fayetteville.
A. V. Brown, L. D. Willis, and P. P. Brussock.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222216, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Center Publication No 97, Univ. of Arkansas, Fayetteville, May 1983. 28 p, 3 Fig, 3 Tab, 43 Ref. OWRT A-058-ARK(1), 14-34-0001-2104.

Descriptors: *Stream pollution, *Detritus, *Decomposition, *Benthos, Physiochemical properties, Fish, Water pollution effects, White River, *Arkansas, City planning, Fayetteville, Effluent discharge.

Recently there has been much emphasis placed on the importance of leaf detritus processing to the energetics of stream invertebrates. This study was designed primarily to assess the effects of municipal effluent on the ability of a stream community to utilize leaf detritus, and secondarily to evaluate the extent of pollution of the White River by the Fayetteville, Arkansas effluent discharge. Physical and chemical water quality, benthos, and fish were sampled periodically at one station upstream and two stations downstream from the discharge, and in the Richland Creek tributary. Processing of leaf detritus was studied at each site using 5 g packs of red oak (Quercus shumardi) leaves. Dissolved oxygen was far below recommended levels which resulted in a fish kill. Substantial increases in orthophosphate, ammonia, chlorides, conductivity, and turbidity were observed downstream. Only 1 fish species (Morone chrysops) was collected downstream as it migrated through. The pattern of benthic species (25 immediately upstream, 8 just downstream, 17 downstream 8 km and 20 in tributary) indicated heavy pollution. Despite this, leaf detritus processing rates were extremely rapid (K = 0.01-0.03) indicating that leaf decomposition is virtually unaffected by macroinvertebrates.
W83-03332

A SURVEY OF WATER TRANSPARENCY IN IOWA LAKES,
Iowa State Univ., Ames. Dept. of Animal Ecology.
J. R. Jones, and R. W. Bachmann.
Proceedings, Iowa Academy of Sciences, Vol 85, No 1, 1978, p 6-9. 4 Fig, 1 Tab, 8 Ref. OWRT A-049-IA(4).

Descriptors: Eutrophication, *Iowa, Lakes, Water quality, Water transparency, *Secchi depth, Survey, Pollutant identification.

Measurements of Secchi disk transparency were made in 50 Iowa lakes and reservoirs in the summer of 1975. Averages of July and August readings for individual lakes ranged from 0.1 to 2.7 m. The man-made lakes in the southern part of the state generally had greater transparencies than the natural lakes in the north. Reduced transparency was related more to algal density than to suspended inorganic matter.
W83-03371

CHANGES IN ESTERASE ZYMOGRAMS OF A PLANKTONIC COPEPOD, ACARTIA CLAUSI, IN A POLLUTED MARINE AREA (SEWAGE OUTPUT OF MARSEILLES) (MODIFICATIONS DES ZYMOGRAMMES DES ESTERASES D'UN COPEPODE PLANCTONIQUE, ACARTIA CLAUSI DANS UNE EMISSAIRE DE MARSEILLE),
Centre Universitaire de Luminy, Marseille (France).
P. Kerambrun, and D. Riviere.
Comptes Rendus Hebdomadaires des Seances de l'Academie des Sciences, Serie 3, Vol 294, No 18, p 929-932, May 1982. 1 Fig, 12 Ref. English summary.

Descriptors: *Water pollution effects, *Municipal wastewater, Gulf of Marseilles, Zymograms, Copepods, Toxicity, *Esterase, Microorganisms, Wastewater disposal, Ocean outfalls, Wastewater pollution, *France.

Esterase activity was revealed after polyacrylamide gel electrophoresis of population samples of the copepod Acartia clausi from 5 stations in the sewage outfall area of Marseilles. Zymograms were compared to those of A. clausi from an area of the Gulf of Marseilles considered as non-polluted. Results show that the urban pollution, mainly organic, had caused changes in the relative activity of the different fractions in the moderately polluted stations, and a clear decrease in the activity of all the fractions in the most polluted station. These variations are the visible results of the physiological response of the organisms to the ecological disturbance: when it remains moderate, adjustment is possible. When it is too great, adjustment does not occur. (Baker-FRC)
W83-03386

HYGIENIC EVALUATION OF HYDROGEN SULFIDE-CONTAINING THERMAL WATERS USED IN HOT WATER SUPPLY SYSTEMS (GIGIENA OTSENKA SEROVODNYKH TERMAL'NYKH VOD, ISPOL'ZUEMYKH V SISTEME GORYACHEGO VODOSNABZHENIYA),
Sanitarno-Gigienicheskii Inst., Tiflis (USSR).
T. A. Beruashvili.
Gigiena i Sanitariya, No 6, p 11-13, 1980. 1 Tab, 5 Ref. English summary.

Descriptors: *Chemical analysis, *Thermal water, *Hydrogen sulfide, *Toxicity, *Laboratory animals, Water analysis, Water quality, Water pollution effects, Public health, *USSR.

The chemical characteristics of waters from hot springs used to supply the population of Tbilisi (Tiflis, Georgia, USSR) were determined, and recommendations for the safe and effective use of these waters were formulated. In toxicological studies on laboratory animals, water containing 3 mg/liter of hydrogen sulfide had no adverse effect on the animals. Water containing 4 to 6 mg/liter of hydrogen sulfide had a slight biologic effect, and that with a concentration from 10 to 12 mg/liter had toxic effects both when ingested and when applied to the skin. (Author's abstract)
W83-03405

THE EFFECT OF AUFWUCHS COPPER ON SPAT SETTLEMENT OF THE OYSTER, CRASSOSTREA VIRGINICA,
District of Columbia Univ., Washington. Dept. of Biology.
H. L. Phelps.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-224444, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Center Report No 47, Univ. of the District of Columbia, June 1983. 41 p, 12 Fig, 2 Tab, 25 Ref, 3 Append. OWRT A-010-DC(1), 14-34-0001-1109.

Descriptors: *Oyster larvae, *Spatfall, *Aufwuchs, *Copper, *Chesapeake Bay, Water pollution effects, Metals, Pollutant identification, Spectroscopy.

Studies on the recent failure of oyster spatfall in the Chesapeake Bay have led to speculation of an unknown toxic factor at the setting site. Oyster larvae set on oyster shell surfaces normally covered with aufwuchs which may have the capacity to bind toxic metals such as copper. Over 200 oysters were collected from six mid-Chesapeake Bay sites paired for high and low spatfall. Aufwuchs samples and oyster tissue analysis indicated no significant difference in copper concentrations between paired sites. In the laboratory, aufwuchs concentrated copper from enriched estuarine water up to 20 times ambient levels in one hour, and failed to depurate copper over two hours, unlike agar (a neutral polysaccharide). Oyster larvae raised to setting stage from a single maternal spawn were exposed to copper-enriched aufwuchs surfaces. The number of larvae setting on aufwuchs surface vs clean (Inner shell) surface decreased significantly with increasing copper in aufwuchs above 100 ug Cu/gm wet weight. Failure of larval metamorphosis ranged from 0% (5 ug Cu/gm wet weight aufwuchs, control) to 81% (760 ug/gm) but was significant only above 100 ug/gm. Since mid-Bay aufwuchs samples average 35.5 ug/gm, ranging up to 103. ug/gm, it is unlikely that present levels are affecting oyster spatfall.
W83-03429

NUTRIENT CONTENTS AND ALGAL GROWTH IN AN IMPOUNDED RIVER: EFFECTS ON OXYGEN BALANCE AND NEED FOR NUTRIENT RETENTION (NAHRSTOFFGEHALTE UND ALGENWACHSTUM IN EINEM GESTAUTEN FLUSS, AUSWIRKUNGEN AUF DIE SAUERSTOFFBILANZ UND NOTWENDIGKEIT DES NAHRSTOFFRUCKHALTES),
K. R. Imhoff, and D. R. Albrecht.
Gas- und Wasserfach: Wasser/Abwasser, Vol 123, No 3, p 140-146, March, 1982. 11 Fig, 2 Tab, 10 Ref. English abstract.

Descriptors: *Eutrophication, *Algae, *Oxygen demand, *Phosphorus, *Rivers, Nitrogren, Organic carbon, Aeration, Reservoirs, Low flow, Algal growth, River flow, Decomposition, Algae control, Model studies, Mathematical models, Ruhr River, Federal Republic of Germany.

A series of impoundments occur on the final 46 km stretch of the Ruhr River where phosphorous, nitrogen, and organic carbon are abundant, causing several heavy algal blooms during the year. This bloom has a detrimental effect on the capacity of the treatment works. Also, an oxygen shortage is always recorded in the river after algal decay at low flows, thus necessitating artificial aeration. By balancing all oxygen supply and consumption, it is shown that about two thirds of the oxygen demand is due to algal decomposition. When water quality of the past 30 years and the results of special laboratory tests are evaluated, results show that phosphates initiate algal growth. Therefore, a phosphate model was developed for the river, which predicts the phosphate content for 1988 and 1998. If phosphate content is reduced, algal growth can be cut by 50%. (Author's abstract)
W83-03454

IDENTIFICATION OF THE WATER QUALITY FACTORS WHICH PREVENT FINGERNAIL CLAMS FROM RECOLONIZING THE ILLINOIS RIVER, PHASE III,
Illinois Natural History Survey, Havana. River Research Lab.
R. E. Sparks, M. J. Sandusky, and A. A. Paparo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-226837, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Center Research Report No 179, University of Illinois, Urbana, April 1983. 63 p, 16 Fig, 15 Tab, 26 Ref. OWRT B-124-ILL(1), 14-34-0001-0217.

Descriptors: Fingernail clams, Sphaerium transversum, Musculium transversum, Sphaeriidae, Silt, Ammonia, Suspended solids, Suspended sediment, Keokuk pool, Mississippi river, *Illinois river, *Pollutant identification, Toxicity, *Clams, *Mussels, *Mollusks, Bivalves, Fluoride, Cadmium, Lead, Metals, *Illinois, Water pollution effects.

The purpose of this research was to determine why fingernail clams have been unable to recolonize a 100-mile reach of the Illinois River where they were abundant prior to a die-off in the 1950's. Fingernaiil clams are major links in food chains leading from detritus and algae to higher level consumers valued by man, such as fish and water fowl. Three suspected toxicants--fluoride, lead and cadmium--and sediments from the reach where the die-off occurred were tested on intact fingernail clams (Musculium transversum) and gill preparations isolated from the clams. Results indicate that the sublethal response exhibited by the gills to fluoride is at least four times more sensitive than the lethal response. Maximum fluoride concentrations reported by the U.S. Geological Survey at two stations in the Illinois River are considerably below concentrations that affected growth and survival of intact clams but slightly above the level that affected isolated clam gills. The results of the land bioassays were ambiguous and additional bioassays are needed. The results of the gill assay suggest that sediments in the Illinois River contain unidentified toxic factors and that sediments in the upper river, closer to the metropolitan areas of Joliet and Chicago, are more toxic than sediments further downstream.
W83-03463

TENDENCIES IN THE CHANGES IN THE SAPROBIC CONDITIONS OF THE MARITSA RIVER (TENDENTSII V IZMENENYATA NA SAPROBIOLODGICHNOTO SUSTOYANIE NA REKA MARITSA),
Bulgarian Academy of Sciences, Sofia.
B. K. Russev, J. I. Uzunov, S. G. Kovachev, I. Y. Yaneva, and L. S. Ivanova.
Khidrobiologia (Sofia), Vol 14, p 51-64, June, 1981. 4 Fig, 10 Ref. English summary.

Descriptors: *Saprophytic bacteria, *Eutrophication, *Aquatic productivity, *Water analysis, *Water pollution effects, Industrial wastes, Toxicity, River, Organic wastes, Water pollution, Maritsa River, Bacteria, *Bulgaria.

The hydrochemical and saprobiological conditions in the Maritsa River were investigated during 1976 and 1977. Five sections were distinguished based on pollution level. The first was Raduil through Kostenets, which had xeno- and oligosaprobity upstream and beta-m-saprobity. From Kostenets through Pazarjik was polluted with toxicants which killed the fauna and obscured the saprobic process. From Pazaejik to Popovitsa was primarily polluted with organic wastes, with a saprobity between alpha-m and beta-m-saprobity. There was active self-purification in the fourth section, from Popovitsa through Dimitrovgrad. Dimitrovgrad through Kapitan Andreevo is polluted with industrial wastes input via the Sazliika river. There are limnotranssaprobic as well as toxic conditions in the river. A study of the saprobic conditions in the Maritsa River in 1955, 1964-1966, and 1976-1977 revealed a gradual deterioration in water quality. A goal of maintaining biological equilibrium and favorable self-purification conditions is recommended for the entire river. Construction of water purification stations is recommended. (Small-FRC)
W83-03473

SPECIES COMPOSITION AND DISTRIBUTION OF THE MACROZOOBENTHOS OF THE MARITSA RIVER (VIDOV SUSTAV I RAZPREDELENIE NA MAKROZOOBENTOSA OT REKA MARITSA),
Bulgarian Academy of Sciences, Sofia.
J. I. Uzunov, B. K. Rusev, S. G. Kovachev, and I. Y. Yaneva,.
Khidrobiologia (Sofia), Vol 14, p 3-15, June, 1981. 1 Tab, 6 Ref. English summary.

Descriptors: *Aquatic productivity, *Population density, River, *Water pollution effects, *Aquatic animals, Oligochaetes, Insects, Caddisflies, Water analysis, Water pollution, Maritsa River, *Bulgaria.

The macrozoobenthos of the Maritsa River was studied in 1976-1977. Two hundred and twenty-nine species belonging to 130 genera were established. Representation was: 23.6% Oligochaeta, 19.6% Ephemeroptera, 10.9% Simuliidae, 10.9% Coleoptera, and 7.4% Trichoptera. Species distribution along the stream is reported and discussed. The analysis of the changes in species composition over the recent 10 to 15 years showed gradual alterations in bottom communities, with elimination of some species and introduction of others. The similarities in fauna populations established in this study and by Rusev (1966-1967) amounted to 46.1%. Seventy-six species were eliminated from the list of zoobenthic species known in 1955 and 55 species from Rusev's 1966 list. Considerable differences were found in the species composition of some sampling stations that had fairly similar results in 1955 and 1966. The changes in species composition and distribution along the river are probably due to the effects of increased industrialization and urbanization on water chemistry and thus on river biota. (Author's abstract)
W83-03474

THE SPECIES DEFICIT OF THE MACROZOOBENTHIC COMMUNITIES AS A CRITERION FOR THE TRANSSAPROBIC INFLUENCES ON THE MARITSA RIVER (VIDOVIYAT DEFITSIT NA MAKROZOOBENTOSNITE SUOBSHCHESTVA KATO KRITERII ZA TRANSSAPROBNITE VLIYANIYA VURKHU REKA MARITSA),
S. G. Kovachev, and J. I. Uzunov.
Khidrobiologia (Sofia), Vol 14, p 75-80, June, 1981. 3 Fig, 8 Ref. English summary.

Descriptors: *Saprophytic bacteria, *Eutrophication, Rivers, *Aquatic productivity, *Water pollution effects, Population density, Population dynamics, Microorganisms, Correlation analysis, Statistical analysis, Maritsa River, Water pollution, *Bulgaria.

The species deficit index was determined simultaneously with the saprobiological characteristics in order to establish both toxic and inert transsaprobic influences in the Maritsa River. These influences were very strong at two points: downstream from Belovo and downstream from Dimitrovgrad. No significant correlation was established between the curves of the saprobiological conditions and the species deficit under the conditions of slight or moderate pollution. Where there were strong transsaprobic influence, the species deficit values rose sharply and became a necessary part of the saprobiological analysis. (Author's abstract)
W83-03475

MACRO AND TRACE-ELEMENTS IN DRINKING WATER AND FOODS. PART 2 (MACRO ED OLIGOELEMENTI NELL'APPORTO IDRICO ED ALIMENTARE. NOTA 2),
For primary bibliographic entry see Field 5B.
W83-03483

5D. Waste Treatment Processes

CHEMOSTAT ADAPTATION OF ESCHERICHIA COLI B/R/1 TO LOW WATER ACTIVITY,
Queen Elizabeth Coll., London (England). Dept. of Microbiology.
G. D. Anagnostopoulos, and G. Dhavises.
Journal of Applied Bacteriology, Vol 53, No 2, p 173-177, October, 1982. 2 Fig, 1 Tab, 16 Ref.

Descriptors: *Escherichia coli, *Sodium chloride, *Osmotic pressure, *Batch culture, Enteric bacteria, *Wastewater treatment, Biomass, Osmosis, Culturing techniques, Cations.

Potassium ion-dependent osmotic adjustments in non-penetrant solute systems should require considerable energy expenditure for potassium ion uptake and electrical compensation. If such a mechanism prevailed in non-penetrant solute batch systems, the maintenance energy requirements could be partly responsible for growth impairment of Escherichia coli B/r/1 under conditions of hypertonicity. Previous studies have shown that E. coli grown in a chemostat at a reduced water activity tend to accumulate glucose independently of the dilution rate used. Chemostat cultures of E. coli under conditions of glucose limitation in a salts medium at high water activity (0.999) and at a water activity of 0.987 controlled by sodium chloride were compared. Dilution rates above 0.035/hr were used. Results suggested that E. coli adapted to the lower water activity of the medium because no significant change was observed in the energy requirement for maintenance, even though the maximum molar growth yield for glucose decreased by 23.2%. Such cultures also exhibited a shorter lag and higher growth rate in batch systems at a water activity of 0.987 compared with cultures started with an unadapted inoculum. (Geiger-FRC)
W83-03151

THE REMOVAL OF SALMONELLA ENTERITIDIS IN ACTIVATED SLUDGE,
M. I. Yaziz, and B. J. Lloyd.
Journal of Applied Bacteriology, Vol 53, No 2, p 169-172, October, 1982. 2 Fig, 10 Ref.

Descriptors: *Salmonella, *Wastewater treatment, *Activated sludge process, *Model studies, *Separation techniques, Activated sludge, Enteric bacteria, Protozoa, Adsorption, Flocculation.

The mechanisms and efficiency of the removal of salmonellae in a laboratory model of the activated sludge process were examined under batch process conditions. Results showed that the removal of salmonellae occurred in three phases. In 4 hr, 90% of the original Salmonella enteritidis inoculum disappeared from the activated sludge mainly because of predation by ciliated protozoa. The remaining 10% was distributed between the liquid phase and sludge floc. During the next 2 hr more than 80% of the remaining salmonellae were then adsorbed to the floc, leaving less than 20% in liquid suspension. After 6 hr there was a slower decline of the remaining salmonellas attached to the floc. The addition of dioctyl sodium sulfosuccinate after 4 hr inactivated the ciliated protozoa population and eliminated the continued reduction of salmonellae from the activated sludge. (Geiger-FRC)
W83-03152

FATE OF NITROGEN AND PHOSPHORUS IN A WASTE-WATER RETENTION RESERVOIR CONTAINING AQUATIC MACROPHYTES,
Agricultural Research and Education Center, Sanford, FL.
K. R. Reddy.
Journal of Environmental Quality, Vol 12, No 1, p 137-141, January/March, 1983. 5 Fig, 4 Tab, 19 Ref.

Descriptors: *Nutrients, *Aquatic plants, *Detention reservoirs, Wastewater treatment, Nitrogen removal, Phosphorus removal, Macrophytes, Agricultural wastes, Ammonium, Nitrates, Denitrification, Accumulation, Bioaccumulation.

The effects of aquatic macrophytes on retention of nutrients from agricultural drainage effluents were studied in tub-sized systems stocked with: (1) pennywort, (2) water hyacinth, (3) cattails and elodea, and (4) no macrophytes (control). In a 27 day detention period plants removed 41-67% of added ammonium and 13-24% of added nitrate; 45-52% of the added N was unaccounted for (lost through ammonia volatilization and denitrification). In the control system algae removed 4.6% of added ammonium and 4.3% of added nitrate; 54% of ammonium and 29% of nitrate were unaccounted for. All systems removed 100% of the ammonium in <6 days. The N removal rate constants (per day) were: peunywort, 0.188; cattail-elodea, 0.184; water hyacinth, 0.039; and control, 0.025. To remove 50% of added N, pennywort and cattail-elodea systems required 4 days; water hyacinth, 18 days; and the control, 28 days. Plant removal of added P was 3-65%, with 7-87% lost by precipitation and adsorption. (Cassar-FRC)
W83-03154

MANAGEMENT OF HUMAN EXCRETA,
Z. -X. LU, G. -Y. Qiang, and X. -D. Dai.
American Journal of Public Health, Vol 72 Supplement, No 9, p 52-53, September, 1982. 1 Ref.

Descriptors: *Anaerobic digestion, *Parasites, *Public health, Wastewater treatment, Fermentation, Digestion, Diseases, Human diseases, Schistosomiasis, Sanitation, Waste disposal, *China.

Widespread incidence of waterborne diseases in the Chinese countryside led to the development of excreta management techniques to minimize pollution of rivers used as drinking water sources. In 1953 vats used to store excreta prior to application to farmland as fertilizer were centralized, replacing individual household storage vessels. They were located away from the river banks and covered to encourage anaerobic digestion. Beginning in 1964 a three-compartment fermentation tank was put into operation. In the first compartment initial decomposition and settling of parasitic ova occurs. The stagnant conditions in the second compartment promote further settling of ova. The third compartment contains digested liquid suitable for use as fertilizer. Reduction of parasitic ova in the process is generally 97-100%. Tank compartments are sized so that the first compartment holds 10 days' waste production. Biogas generators are also becoming increasingly popular; 2000 are presently in use in Shanghai County. (Cassar-FRC)
W83-03191

REMOVAL OF TRACE CHLORINATED ORGANIC COMPOUNDS BY ACTIVATED CARBON AND FIXED-FILM BACTERIA,
Stanford Univ., CA. Dept. of Environmental Engineering.
E. J. Bouwer, and P. L. McCarty.
Environmental Science and Technology, Vol 16, No 12, p 836-843, December, 1982. 8 Fig, 7 Tab, 24 Ref.

Descriptors: *Organic compounds, Water treatment, *Activated carbon, *Bacteria, Films, Microorganisms, *Wastewater treatment.

A comparison was made between the removal of chlorinated benzenes and aliphatics in a granular activated carbon (GAC) column with microbial activity versus a control column (BC) with only bacterial growth. A solution containing between 10 and 30 micrograms per liter of each chlorinated organic compound and 1.39 mg/L sodium acetate was continuously applied to both columns under aerobic conditions at a 60-min empty-bed detention time for 2 years. The GAC column initially removed all the compounds with 95-98% efficiency. Complete break-through of the chlorinated aliphatics eventually occurred, and these compounds were not biodegraded in either column. Effluent concentrations of the chlorinated benzenes in the GAC column did not change significantly during the 2 years of operation. Several chlorinated benzenes were biodegraded in both GAC and BC columns after a suitable acclimation period, and carbon-14 tracer experiments confirmed removal by a biological mechanism in both columns with complete mineralization to inorganic end products. The combination of bio-degradation and adsorption gave stability and reliability to the GAC performance. (Baker-FRC)
W83-03194

ADVANCED WASTEWATER TREATMENT BY ION EXCHANGE,
Istituto di Ricerca sulle Acque, Bari (Italy).
L. Liberti, G. Boari, and R. Passino.
Effluent and Water Treatment Journal, Vol 22, No 7, p 253-255, 256-257, July, 1982. 3 Fig, 4 Tab, 13 Ref.

Descriptors: *Ion exchange, *Nutrient removal, *Advanced wastewater treatment, *Wastewater treatment, Ammonia, Phosphate removal, Nitrogen removal, Fertilizers, Costs, Virginia, California.

This paper reports experiences in removing ammonia and phosphates from municipal effluents by ion exchange. The RIM-NUT process depends on selective uptake of ammonia from biologically treated wastewater by cationic and anionic exchange resins. Regeneration of the resins by seawater strength NaCl produces an eluate to which a Mg salt is added to precipitate > 99% pure MgNH4PO4 (6H20), a valuable slow-release fertilizer. Average nutrient removals are 85-95%. Costs for operating full-scale plants were: the $20 million plant at Tahoe Truckee Sanitation Agency, California, 67 cents-75 cents per cu m; and the $82 million plant at Upper Occoquan Sanitation Agency, Virginia, 49.2 cents per cu m. These costs do not include the return from selling fertilizer. (Cassar-FRC)
W83-03196

A METHOD FOR CALCULATING THE DIMENSIONS OF LONG SEWAGE FORCE MAINS,
Thessaloniki Univ., Salonika (Greece).
H. Hadjianghelou.
Gas- und Wasserfach: Wasser/Abwasser, Vol 123, No 8, p 408-412, August, 1982. 2 Fig, 1 Tab. English summary.

Descriptors: *Retention, *Design criteria, *Wastewater treatment, *Operating policies, Wastewater, Design standards, Settling basins, Sewerage, Pumping, Pumping plants.

The long force mains of sewage pumping stations create substantial operating difficulties due to long retention times when discharge is small. Operating difficulties include problems in cleaning, emptying, and filling the mains. Retention time is thus an important factor which should influence the dimensions of a design for a plant. A method is presented which leads to design solutions based on maximum allowed retention time. The strategy in this method is to build fewer, larger mains rather than numerous small ones. Example calculations are presented for the design of pumping mains for Thessaloniki in Greece. (Titus-FRC)
W83-03199

REUSE OF TREATED MUNICIPAL WASTEWATER IN THE TECHNICAL SUPPLY OF INDUSTRIAL COMPANIES IN MOSCOW (DIE WIEDERVERWENDUNG DES GEREINIGTEN KOMMUNALEN ABWASSER IN DER TECHNISCHEN WASSERVERSORGUNG DER MOSKAUER INDUSTRIEBETRIEBE),
Moscow Stadt Verwaltung fuer Wasserversorgund und Kanalization (USSR).
P. I. Galanin.
Wasserwirtschaft-Wassertechnik, Vol 32, No 8, p 264-266, 1982. 4 Fig, 1 Tab, (No English Summary).

Descriptors: *Water reuse, *Municipal wastewater, *Industrial water, *Tertiary wastewater treatment, *Filtration, Moscow, *USSR, Wastewater treatment, Packed beds, Gravel filters, Wastewater facility, Activated sludge process, Biological filters, Biological wastewater treatment, Water quality, Chlorination, Disinfection.

In the last few years, large sewer systems and wastewater facilities have been constructed in Moscow (USSR) including several hundred local industrial wastewater treatment plants. All municipal wastewater is treated in biological facilities whose efficiency is 94-95%, with additional treatmenent increasing this to 98-99%. The quality of treated municipal water used by industry is equal to that of the water types previously used. Water is prepared for specific technological processes, whereby the levels of certain substances (e.g., salts, organic compounds, biologically oxidizable organics) must be regulated. Laws forbid the use of such water by industries in which product contamination could directly harm the consumer (e.g., food and pharmaceuticals); in other industries where personnel may come into contact with the water, safety measures are required. Gravel-bed filters were first used for biological tertiary treatment at the Senelograd plant in 1965; these function by two parallel procedures: retention of suspended particles in the filter after the secondary settling basin and utilization of dissolved organic matter by activated sludge bacteria in the filter. Filtration time is 16 hr, and filter speed is 10-13 cu m/sq m per hr. After treatment, the water is disinfected by chlorination. This facility proved so successful that it was incorporated into the Novo-Kuryanovskaya activated sludge plant (treating 1 million cu m wastewater/day) with modifications: coarser granite grains of 3-10 mm were used in the filter, full drainage was installed, and filter washing with water was replaced by washing with air and water. This resulted in a doubling of performance capacity. The use of tertiary treated wastewater is about 30,000 cu m/day and is expected to increase. Most is used for cooling, watering and cleaning. (Gish-FRC)
W83-03222

PROBLEMS OF THE LOAD AT VEB ZELLSTOFF-UND PAPIERFABRIK ROSENTHAL (PROBLEME DER ABWASSERLAST IM VEB ZELLSTOFF-UND PAPIERFABRIK ROSENTHAL),
VEB Zellstoff- und Papierfabrik, Rosenthal (German D.R.).
A. Geisenheiner.
Wasserwirtschaft-Wassertechnik, Vol 32, No 8, p 268-271, 1982. 12 Fig, 3 Ref. (No English Summary).

Descriptors: *Industrial water, *Bleaching wastes, *Biological treatment, *Technology, *Wastewater treatment, *Industrial wastes, Condensation, Steam, Alkalinity, Chlorination, Pulp and paper industry, Textile industry, *German Democratic Republic.

Paper and pulp industries have traditionally consumed large quantities of water. Bleaching, sorting and other processing have required up to 1500 cubic meters of water. Bleaching, sorting and other processing have required up to 1500 cubic meters of water per ton of product in plants in Germany. Reconstruction and expansion of a plant in Rosenthal in 1977 resulted in a reduction in water requirements. The plant added new evaporation technology and water recirculation to existing mechanical and biological wastewater treatment processes. However, difficulties in effective water treatment exist. The presence of lignin in wastewater hinders biochemical decomposition. Very caustic chemicals used in the bleaching process and organic material in the condensate of the evaporation process pose further problems. Treatment of textile wastes is less successful than treatment of pulp wastewater. (Titus-FRC)
W83-03223

RETURNING THE TYNE TO LIFE,
Howl (Lee) Ltd., Tipton (England).
J. Smith.
Water Services, Vol 86, No 1038, p 375-377, August, 1982. 1 Fig.

Descriptors: *Wastewater treatment, *Pumps, *Mechanical equipment, Tyne River, Howdon, Estuaries, Water pollution control, Water treatment facilities, *United Kingdom.

The background to the Tyneside Sewerage Scheme is explained, and in particular the pumping aspects of the project are described. Real progress toward reducing pollution in the Tyne estuary began in 1958 following formation of a working party of representatives from twenty Tyneside public authorities. Nevertheless, only about 5% of the total sewage flow dumped into the river was receiving any form of treatment. The problem was further aggravated by the complex pattern of currents in the river, which prevented polluting sewage from flowing out of the estuary with each tide. Howdon sewage treatment works was built on the north bank of the Tyne and was designed to serve a future population of one million persons, and providing both preliminary and primary treatment of sewage from thee north of the Tyne and primary treatment for sewage coming from south of the Tyne. (Baker-FRC)
W83-03231

TREE OF KNOWLEDGE.
Water, No 43, p 14-15, March, 1982. 1 Fig.

Descriptors: *Wasterwater treatment, *Sludge conditioning, Cost analysis, Research priorities, *United Kingdom.

Following the reorganization of the water industry in the United Kingdom, the Standing Technical Committee on Wastewater Treatment was created to advise on the design, construction, operation, and maintenance of wastewater treatment facilities and to advise on priorities and applications of reelated research projects. The Committee placed emphasis on the identification of research and development projects which would secure the maximum value out of existing assets, and development projects which would secure the maximum value out of existing assets, The National Water Council, on behalf of the Committee, has published a volume entitled Tree of Knowledge, which reviews potential research areas in the fields of wastewater and sludge treatment. This volume presents a series of tables for each treatment stage. The tables identify the objective of the process, ask questions arising from the process stream variables and allocate priority for obtaining the answers, and examine the relationships between the given process and other stages of the processes. The review identifies a number of areas, such as the effects of bar spacing on screening efficiency and the influence of reactor loading on solids removal in humus tanks, in which it would have been assumed that sufficient information was already available. (Carroll-FRC)
W83-03234

WET OXIDATION FOR THE TREATMENT OF TOXIC INDUSTRIAL WASTES.
Water and Pollution Control, Vol 120, No 5, p 22-23, September/October, 1982.

Descriptors: *Oxidation, *Industrial wastes, *Wastewater treatment, *Wet oxidation, Design criteria, Financial aspects, Wetox, Temperature effects, Engineering, Equipment, Ontario.

The wet-oxidation system described is a result of a nine-year, million dollar development. It is a process in which liquid organic wastes are rendered harmless with minimum environmental impact. The process involves the destructive oxidation of most organic materials under water by forcing air or oxygen into the materials at elevated temperatures and pressures. The organic materials oxidize readily on contact with the oxygen, being converted mainly to carbon dioxide and releasing energy in the form of high pressure steam. This steam can be recovered for energy use with up to 80% efficiency. The products from wet oxidation are automatically and thoroughly scrubbed, since the entire reaction is carried out under water. The system provides an efficient means of recovering valuable energy from even relatively dilute waste streams. The system described is based on a horizontal agitated, multi-compartmented, cascading reactor and is able to operate at lower temperatures than other systems. Cost comparisons indicate that the Wetox process costs the same as or less than a comparable biological or incineration system. (Baker-FRC)
W83-03235

PLASTIC TANKS: PITFALLS TO AVOID,
Forbes (Kenneth) (Plastics) Ltd., Downham Market (England).
For primary bibliographic entry see Field 8G.
W83-03250

USE OF ANAEROBIC DIGESTION IN THE AGRICULTURAL AND FOOD INDUSTRIES (APPLICATION DE LA DEGESTION ANAEROBIE DANS LES INDUSTRIES AGRO-ALIMENTAIRES),
Distillerie Cooperative Agricole de la Region d'Auvernaux (Belgium).
J. P. Lescure, J. Chandesris, and P. Oger.
Industries Alimentaires Agricoles, Vol 99, No 3, p 123-130, March, 1980. 4 Fig, 3 Tab, 14 Ref. English summary.

Descriptors: *Industrial wastes, *Anaerobic conditions, *Biodegradation, *Digestion, *Food processing industry, Biological treatment, Sugars, Foods, Food-processing wastes, *Anaerobic digestion, *Wastewater treatment.

Full-scale anaerobic wastewater treatment plants have only recently been introduced in Europe, although they have been used by industry in the United States and South Africa for some time. As a result of successful experiences with this technology in sugar factories, particularly at Genappe in Belgium, the French company ERPAC is studying anaerobic plants for some other food industries. It has built a digestor for a distillery in Auvernaux. Food industries are among the greatest water polluters. The anaerobic technique is well-suited to the seasonality of the food industry, since it requires only 2 to 8 days for start-up after long periods of idleness. (Titus-FRC)
W83-03252

ON-SITE SEWAGE DISPOSAL: SITE SUITABILITY, SYSTEM SELECTION AND SOIL ABSORPTION AREA SIZING,
Pennsylvania State Univ., University Park. Coll. of Agriculture.
D. D. Fritton, D. A. Long, G. Aron, and G. W. Petersen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-219725, Price codes: A13 in paper copy, A01 in microfiche. Institute for Research on Land and Water Resources Completion Report, The Pennsylvania State University, Universty Park, May 1983. 297 p, 17 Ref, 9 Apend. OWRT B-122-PA(3), 14-34-0001-0245.

Descriptors: *Home sewage disposal, *On-lot sewage disposal, *On-site sewage disposal, *Computer information delivery system, Septic tank effluent disposal, Seepage bed, Seepage trench, Elevated sand mound, Intermittent sand filter, Iodine disinfection, Rock permeability, Numerical(Relaxation) model, Percolation test, Shallow-well pump-in test, Hydraulic conductivity, *Pennsylvania, Standards, Sewage dispoal facilities, Soil water flow models, Steady state flow, Two-dimensional flow, Porous media.

Estimates of the reliability of on-site effluent disposal systems indicate that less than 50% perform satisfactorily over their design life. It is the objective of this report to describe a prototype computer information delivery system developed to improve site suitability decision making, on-site effluent disposal system selection, and soil absorption area sizing decisions. The completed computer model is written in the interactive computer language called APL. It is designed to be user friendly in the sense that little or no prior knowledge of

computers is required for its use.Users are led through a series of questions for their specific effluent disposal site. At the end of a session, the user is given a choice of system designs which are suitable. A complete copy of the computer code, its documentation, and a dictionary of terms is included. In the process of developing the model, several other studies were completed. Each individual study as initiated to provide input data or to help make decisions on alternatives that could be used. These studies included a survey of intermittent sand filter systems, a study of iodine as a disinfectant, development of a numerical model to describe flow from elevated mound systems, a literature survey on rock permeability, an experimental study of the relationship between hydraulic conductivity and the percolation rate test, and a validation study of a two-dimensional soil water flow computer model. As a result of this study, the developed prototype model is operational for research purposes. It is concluded that additional validation studies need to be made before the model can be confidently used on a routine basis.
W83-03268

LAGOON ALGAE AND THE BOD TEST,
For primary bibliographic entry see Field 5A.
W83-03400

WASTEWATER TREATMENT IN RURAL AREAS. THERE DOESN'T ALWAYS HAVE TO BE A CENTRAL WASTEWATER TREATMENT FACILITY (ABWASSERREINIGUNG IM LANLICHEN RAUM. ES MUSS NICHT IMMER EINE ZENTRALKLARANLAGE SEIN).
Gas- und Wasserfach: Wasser/Abwasser, Vol 123, No 8, p 417-418, August, 1982. 2 Fig. (No English Summary).

Descriptors: *Activated sludge process, *Ponds, *Rural areas, *Wastewater facilities, *Economic aspects, Costs, Construction costs, Maintenance costs, Wastewater treatment, Aeration, Large wastewater facilities, Small wastewater facilities, Water quality, Wastewater facility size.

New solutions for wastewater treatment in rural areas are required due to an expected decrease in available funds. Smaller facilities may now be considered for economic reasons, whereas they were rejected in the past as more susceptible to breakdowns, less efficient in treatment level, and requiring more maintenance than large central plants. Construction and maintenance costs are compared for facilities with activated sludge lagoons (i.e., small facilities suitable for rural areas) and activated sludge plants with continous aeration. Construction costs were lower for the facilities with lagoons: 10 lagoons, each designed for 1,000 inhabitants + or population equivalents (PE), cost about the same to construct as 1 activated sludge plant for 10,000 PE; while for ponds designed for > 1,500 inhabitants + PE, costs were lower than for activated sludge plants. For maintenance, 10 lagoons, each for 1,000 inhabitants, required 50 hr/wk, and 1 activated sludge plant for 10,000 required 38 hr/wk. Maintenance costs were about the same for five ponds designed for 2,000 clients each as for one 10,000 client activated sludge plant. For large centralized facilities, the cost of sewers must also be added, and as these cost about 400,000 DM/km for a 300-mm-diameter pipe, the economic efficiency of every facility with sewers of > 1 km should be scrutinized. One disadvantage of activated sludge lagoons is that plankton develop in the secondary treatment pond, leading to high 5-day BOD in summer. Filtered samples from the pond outlet must be used to obtain a true 5-day BOD reading. On the other hand, large facilities cause increased pollution loads in receiving streams by removing water from smaller streams to be treated and not returning it and by directing rainwater through storm drains directly to large streams, intensifying the flood wave. (Gish-FRC)
W83-03435

COSTS OF PHOSPHATE ELIMINATION IN MUNICIPAL WASTEWATER FACILITIES (KOSTEN DER PHOSPHATELIMINATION IN KOMMUNALEN KLARANLAGEN),
Hanover Univ. (Germany, F.R.). Inst. fuer Siedlungswasserwirtschaft.
H. Schussler.
Gas- und Wasserfach: Wasser/Abwasser, Vol 122, No 6, 251-257, June, 1981. 8 Fig, 5 Tab, 8 Ref. English Abstract.

Descriptors: *Municipal wastewater, Phosphorus removal, *Capital costs, *Operating costs, *Total costs, Costs, Maintenance costs, Chemical precipitation, Investment, Economic aspects, *Federal Republic of Germany, *Wastewater treatment, Storage, Personnel, Maintenance costs, Cost savings, Prices.

The German Department of the Environment conducted a survey of the capital, operating, and annual (total) costs of phosphate removal in municipal wastewater treatment facilities. The study took place in 1978/79 and covered pre-, simultaneous, and postprecipitation using Me3+ (e.g., iron chloride, aluminum chloride and sulfate), granular media (e.g., ferri-Floc), Fe2+. Savings can be made by constructing a new mechanical/biological stage with preprecipitation, since this reduces load on the biological stage by up to 40%; however, operating and supply costs are greater with precipitation. Whether simultaneous precipitation results in savings depends on wastewater composition. Precipitation can also remove other pollutants, resulting in cost savings. Despite significantly higher capital costs, annual costs of postprecipitation can be lower than those of simultaneous and preprecipitation (which are about the same), though the cheapest procedure is simultaneous precipitation with divalent iron salts (for phosphate concentrations of 20 mg/l before and 2 mg/l after treatment. Extra costs for reducing phosphate to 1 mg/l with postprecipitation were 0.01 - 0.06 DM/cu m. (Gish-FRC)
W83-03436

NEW DESIGN GUIDELINES FOR VERTICAL-CURRENT FINAL SETTLING TANKS FOR ACTIVATED SLUDGE PLANTS (NEUE BEMESSUNGS-GRUNDLAGEN FUR VERTIKAL DURCHSTROMITE NACHKLARKECKEN VON BELEBUNGSANLAGEN),
H. Resch.
Gas- und Wasserfach: Wasser/Abwasser, Vol 122, No 6, p 236-242, June, 1981. 9 Fig, 20 Ref. English abstract.

Descriptors: *Settling tanks, *Design criteria, *Activated sludge process, *Flocculation, *Filters, *Wastewater treatment, Advanced wastewater treatment, Dortmund tanks, Vertical current tanks, Sludge thickening, Water quality, Fluidization, Recirculation, Hydraulic properties.

Studies were undertaken at four West German activated sludge facilities with funnel-shaped final settling tanks to formulate guidelines for the design of such so-called Dortmund tanks. The tanks are a version of vertical-current tanks, which are defined as those in which the vertical component of the wastewater flow path is more than one-third of the horizontal component. Previously formulated guidelines have not taken into account the fact that in these tanks fluidization causes the formation of a filter layer of sludge flocs in vertical upflow. This floc filter is characterized by a horizontal sludge layer and an even distribution of solids in the filter volume. The studies also showed that the volume concentration constantly adopts the value of the comparison sludge volume in the tank inlet when the comparison sludge volume equals the comparison sludge volume in the floc filter, so long as the thickening zone is large enough and no backwash from it flows into the filter space. Whereas in horizontal current tanks increasing load and recirculation leads to a gradual worsening of the effluent quality, in vertical current tanks the sludge level slowly increases through an increase in filter volume without impairing effluent quality. Only when the sludge level approaches the water level does overloading occur -- the sludge overflows. When the thickening zone is used up, the filter space takes over the function of separation and storage. In the design of these tanks, the influence of tank shape can largely be ignored if surface feed is related to that tank cross-section which halves the available filter zone volume. Below this level, the filter space should always be funnel-shaped. An equation is given for the dimensioning of the thickening zone, which can be either funnel-shaped or cylindrical. (Gish-FRC)
W83-03437

ANAEROBIC ACTIVATED SLUDGE TREATMENT OF FILTRATES FROM THERMALLY CONDITIONED SLUDGES (DIE BEHANDLING VON FILTRATWASSERN THERMISCH KONDITIONIERTER SCHLAMME NACH ANAEROBEN BELEBUNSVERFAHREN),
Emschergenossenschaft, Essen (Germany, F.R.).
S. Schlegel, and K. H. Kalbskopf.
Gas- und Wasserfach: Wasser/Abwasser, Vol 123, No 4, p 203-208, April, 1982. 7 Fig, 5 Ref. English abstract.

Descriptors: *Anaerobic digestion, *Activated sludge process, *Wastewater treatment, *Sedimentation, *Chemical oxygen demand, Activated sludge, Wastewater facilities, Water pollution control, Federal Republic of Germany, Emscher River.

At the Emschergenossenschaft's Central Sludge Treatment Plant heat is used for conditioning the waste activated sludge. As a result of this, 2000 to 3000 cu m/day of highly polluted, odoriferous wastewaters are produced. These are treated by the anaerobic contact process. For the anaerobic treatment, three reactors were built with a total volume of 18,000 cu m. The activated sludge is retained in three gas-tight sedimentation tanks with a total volume of 1320 cu m. By the process, the COD, which averages 15,000 g/cu m is reduced by 70%. The gas yield is nearly 9000 cu m/day. Problems during the start-up phase were overcome, and the process has been very stable. The digested waters are discharged into the Emscher. The remaining pollutants are almost completely decomposed by the subsequent activated sludge processing at the Emscher Mouth Treatment Plant. (Author's abstract)
W83-03440

BIOLOGICAL WASTEWATER PURIFICATION WITH TECHNICAL OXYGEN (BIOLOGISCHE ABWASSERREINIGUNG MIT TECHN. REINEM SAUERSTOFF),
Knoll A.G., Minden (Germany, F.R.).
G. Klinzmann, and D. Stammann.
Gas- und Wasserfach: Wasser/Abwasser, Vol 122, No 6, p 258-262, June, 1981. 4 Fig, 1 Tab, 6 Ref. English abstract.

Descriptors: *Wastewater treatments, *Wastewater treatment facilities, *Activated sludge treatment, *Oxygen, Pilot plants, Nozzles, Odors, Odor control, Activated sludge process, Federal Republic of Germany.

After three years of construction, the fully biological purification plant at the Knoll AG works in Minden (Federal Republic of Germany) was put in operation. The plant has a daily purification capacity of up to 10 tons BOD5. In contrast to conventional procedures, the activated sludge is supplied with technically pure oxygen. BASF jet nozzles are used for gas adsorption. Because of the closed design of the activated sludge reservoirs, almost complete utilization of the oxygen is possible which almost completely eliminates annoying odors. The initial operating results of the plant agree with pilot plant results. Tests, design data, and initial operating results of the plant are presented. (Author's abstract)
W83-03443

EFFECT OF PRECIPITATION PURIFICATION ON THE BEHAVIOR OF SLUDGES DURING MECHANICAL DEWATERING (EINFLUSS DER FALLUNGSREINIGUNG AUF DAS VERHALTEN VON KLARSCHLAMMEN BEI DER MECHANISCHEN ENTWASSERUNG),
D. Gleisberg.
Gas- und Wasserfach, Wasser/Abwasser, Vol 122, No 9, p 387-391, September, 1981. 10 Fig. English abstract.

Descriptors: *Dewatering, *Sludge thickening, *Chemical precipitation, *Pilot plant studies, *Sludge drying, Drying, Digested sludge, Municipal wastewater, Iron salts, Aluminum salts, Flocculation, *Wastewater treatment, Sludge conditioning.

Four comparative test series were carried out in four municipal sewage plants to determine effects of precipitation purification on the behavior of sludge during mechanical dewatering. Three pilot plants were used: a filter bed, a filter press, and a hydrostatic bag. Sludge obtained by post-precipitation can be successfully dewatered if it is mixed with digested sludge. The amount of flocculating agent needed for conditioning digested sludge is larger when precipitation is used. In these tests, the amount of flocking agent required (g/kg of dried solid matter) was smaller than expected, indicating tha the mixed sludges are more sensitive to the conditioning agent. The resulting dried solid matter was comparable when to that obtained with conventional dewatering of digested sludges. When iron-III salt was compared to aluminum salt in simultaneous precipitation, the iron salt was most effective when the sludge was dewatered in a belt filter. This result was not confirmed with a filter press or hydrostatic bag. On the average, dewatering of sludges obtained by pre-precipitation yielded almost the same results as simultaneously precipitated sludges. Because of the smaller volume of sludge, preference is given to simultaneous precipitation. (Small-FRC)
W83-03444

AUTOMATION IN WASTEWATER TECHNOLOGY AND WATER QUALITY. PRACTICAL EXPERIENCE WITH CONTROL, REGULATION, AND AUTOMATION IN SEWER SYSTEMS, WASTEWATER TREATMENT, AND WATER QUALITY CONTROL (AUTOMATION IN DER ABWASSERTECHNIK UND GEWASSERGUTE. PRAKTISCHE ERFAHRUNGEN BEI DER STEUERUNG, REGELUNG UND AUTOMATION BEI DER ABWASSERABLEITUNG, ABWASSERBEHANDLUNG UND GEWASSERGUTEUBERWACHUNG,
Technische Univ., Munich (Germany, F.R.). Lehrstuhl und Pruefamt fuer Wassergutewirtschaft und Gesundheitsingenieurwesen.
W. Hegemann.
Gas- und Wasserfach: Wasser/Abwasser, Vol 122, No 10, p 438-442, October, 1981. (No English Summary).

Descriptors: *Automation, *Wastewater treatment, *Sewer systems, *Water quality control, *Wastewater facilities, Sweden, England, Process control, Computers, Measuring instruments, Mathematical models, Rainfall, Storm-overflow sewers, Sludge, Activated sludge process, Data collections, River basins, United States.

A summary is presented of the approximately 85 lectures delivered at the 1981 Workshop on Automation in Wastewater Technology held in Munich and Rome. While process control is not yet widespread, partial automatic control is more common. Principles of automation applications differ in various countries. Measurement and control of wastewater conveyance was covered by talks on a British system for the monitoring and control of rainfall overflow, consisting of a large central computer and several decentralized microprocessors, monitoring and measuring of the quality of rainfall overflow, and water volume measurement in sewers. Many lectures concerned mathematical modelling, especially in the field of activated sludge plants; models calculating the maintenance of a constant sludge concentration, the adaptation of oxygen addition to small facilities, and the maintenance of a constant oxygen concentration in step feeding were presented. Measuring instruments and parameters were discussed in works on the testing of such instruments, an underwater device for measuring respiration during the activated sludge process, and the calculation of the oxygen consumption of activated sludge by analyzing waste gas caught in the activation basin. Lectures on such topics as the possibility of regulating dissolved oxygen content, attempts to keep sludge load constant by switching the activation basin on and off, and the expansion of a mechanical facility to include activated sludge procedures and automation were grouped under the heading 'Control and Regulation in Wastewater Treatment Facilities.' The three contributions on automation described experiences with a freeze conditioning plant and a sludge-pyrolysis plant and the possibilities of the control of a sludge dewatering facility with vacuum filters. The subject of water quality monitoring was covered mainly by lectures on centralized data collection systems in river basins. (Gish-FRC)
W83-03469

5E. Ultimate Disposal Of Wastes

PHYSIOCHEMICAL PRETREATMENT OF LANDFILL LEACHATES USING COAGULATION,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Chemical and Biochemical Engineering.
For primary bibliographic entry see Field 5G.
W83-03172

IDENTIFICATION AND ASSESSMENT OF EFFLUENT RESIDUALS IN TREATED LEACHATE FROM LANDFILL DISPOSAL SITES,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
F. G. Pohland, J. P. Gould, R. E. Ramsey, and E. S. K. Chian.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-219766. Price codes: A07 in paper copy, A01 in microfiche. Environmental Resources Center Report No. ERC 07-83, Georgia Institute of Technology, Atlanta, May 1983. 119 p, 43 Fig, 25 Tab, 182 Ref. OWRT A-088-GA(1). 14-34-0001-0111.

Descriptors: *Chlorination, *Leachate, Leachate organics, Leachate recycle, *Recycling, Toxic metals, *Toxicity, Pollutant identification, *Heavy metals, *Sludges, *Landfills, Waste disposal, *Organic compounds, Disposal sites, Aromatic compounds.

The research reported herein represents an examination of the generation, behavior and fate of specific organic compounds and functional groups in landfill test cells containing admixed heavy metal sludges. Evaluation of the impact of recycle of leachate in these systems was an object of these studies. Aromatic hydroxyl, carbohydrates, volatile acids and total carboxyl groups were the organic parameters of most use in this research. The behavior of these parameters relative to total sludge quantities and to soluble zinc, cadmium and nickel levels was assessed. The levels of heavy metal sludge in these cells was found to have a distinctly inhibitory impact on the balance between consumption and production of the various organic parameters in the two most heavily laden columns. On the other hand, the column with the least sludge behaved in a manner very similar to that of the sludge free control column suggesting a distinct capacity for the assimilation of such a sludge with minimal detrimental impact on the biological environment of the landfill. This effect was noted for all parameters studied. The heavy metal sludges demonstrated a strong capacity for binding the aromatic hydroxyl fraction of the leachate while the mobilization of toxic metals was strongly correlated with concentrations of aromatic hydroxyl in the leachate. Recycle was found to enhance the process by which moderate quantities of heavy metal sludges are assimilated by the columns with minimal inhibitory effect and to moderate the wide variations in leachate composition characteristic of ordinary landfills. The oxidation of leachate with hypochlorous acid was found to result in only moderate decreases in chemical oxygen demand even at quite high dose levels. Good disinfection was possible although a high level of chlorine demand was observed. Analysis of the chlorinated leachate by gas chromatography/mass spectrometry demonstrated the formation of complex array of potentially hazardous haloorganic compounds by chlorination of the leachate organic compounds. These findings predicate against chlorination as a means of treating leachates.
W83-03272

UNDISTURBED CORE METHOD FOR DETERMINING AND EVALUATING THE HYDRAULIC CONDUCTIVITY OF UNSATURATED SEDIMENTS,
Illinois State Geological Survey Div., Champaign.
For primary bibliographic entry see Field 2G.
W83-03319

CHEMICAL EFFECTS OF SELECTED TRACE-METALS FROM SANITARY LANDFILL LEACHATES ON GROUNDWATER QUALITY,
Kansas Water Resources Research Inst., Manhattan.
E. E. Angino, and E. C. Vogl.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222380, Price codes: A04 in paper copy, A01 in microfiche. Contribution Number 221, Dec 1981. 61 p, 8 Fig, 9 Tab, 39 Ref, 3 Append. OWRT A-094-KAN(1), 14-34-0001-9018.

Descriptors: Groundwater, Supersaturation, Percolation, Chemicals, Solid wastes, Municipal wastes geohydrology, Aerobic conditions, *Kansas, *Path of pollutants, *Trace metals, Lawrence, Water pollution sources, Kansas River, *Sanitary landfills, Hazards, *Leachates, Disposal sites.

Nationwide use of sanitary landfills as disposal sites for municipal wastes has increased concern for their capacity to contaminate local groundwater systems. This matter stems from the fact that potentially dangerous leachage ultimately forms in and permeates regions adjacent to a landfill. Under favorable geohydrologic conditions, this solution may enter nearby aquifers used for drinking water. Two sanitary landfills, both in Lawrence, Kansas, were investigated as to the actual or potential impact of selected trace-metals (Cu,Co,Cr,Ni,Pb,Cd,Mn,Fe, and Zn) accumulated in these leachates on local ground water quality. In addition, pH, specific conductance, temperature, and dissolved oxygen were used to further identify potential hazards at these two landfills. One landfill, southwest of Lawrence, is in an upland area and has been out of use since 1969. The effluent from this landfill has general chemical characteristics and trace-metal content indicating an aerobic environment. There appears to be no contamination by this landfill of surrounding local ground water. The other landfill, north of Lawrence, is in the Kansas River floodplain and has been in use since 1970. The leachate generated typically contained less dissolved oxygen, more dissolved solids, more soluble trace-metals, and is more acidic than leachate derived from the upland landfill. At the floodplain landfill, an anaerobic-aerobic environment exists immediately surrounding the area of buried refuse. There is no evidence based on chemical constituents investigated that the floodplain landfill poses any threat to local ground water quality or to the water quality of the adjacent Kansas River.
W83-03340

PRIORITY POLLUTANTS IN MUNICIPAL SEWAGE SLUDGE, PART II,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
L. M. Naylor, and R. C. Loehr.
BioCycle, Vol 23, No 6, p 37-42, November/December, 1982. 5 Tab, 28 Ref.

Descriptors: *Sludge, *Land disposal, *Public health, Human diseases, Fate of pollutants, Pesticides, Toxicity, Water pollution sources, Food chain.

A perspective on public health risks and the absence thereof from land application of sludge is presented based on data from sludges produced in 20 United States cities. Data is presented which shows that organic priority pollutants have acute toxicities similar to those of pesticides and household chemicals. Application rates of priority pollutants to sludge amended soils are substantially less than typical pesticide application rates to agricultural soils. While insufficient information is currently available on the fate and transformation of

organic priority pollutants in soils and on the uptake and translocation of such chemicals in crops to assess food chain risk, scenarios were developed which provide a perspective on potential health risks associated with the direct ingestion of contaminated soil and crops bearing the residue of such soil and sludge. These scenarios indicate that, except possibly where sludge is consumed directly in very large amounts, consumption of contaminated soils or crops is not likely to result in the ingestion of amounts of organic priority pollutants exceeding the acceptable daily dose. (Baker-FRC)
W83-03406

DEVELOPMENTS, RECOMMENDATIONS AND APPLICATIONS OF TESTS FOR EVALUATING THE CHEMICAL STABILITY OF HIGH-LEVEL RADIOACTIVE SOLID WASTE FORMS,
North Carolina State Univ. at Raleigh. School of Engineering.
For primary bibliographic entry see Field 5B.
W83-03427

CHEMICAL SPECIATION OF LEACHATES FROM WASTE DISPOSAL SITES,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W83-03432

5F. Water Treatment and Quality Alteration

THE EFFICACY OF REMOVAL OF HEAVY METALS FROM WATER BY CALCITE,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
S. D. Faust, and C. M. Schultz.
Journal of Environmental Science and Health, Part A, Environmental Science and Engineering, Vol 18, No 1, p 95-102, 1983. 2 Fig, 1 Tab, 9 Ref.

Descriptors: Metals, *Calcite, Adsorption, *Heavy metals, Calcium carbonate, Cadmium, Copper, Lead, Zinc, *Water treatment.

A commercial grade of calcite adsorbed Cd, Cu, Pb, and Zn from water in batch and column tests. No attempt was made to control pH, which was 7.0-8.4 in the columns and 8.0-9.2 in the batch systems. The calcite adsorbed or precipitated about 80% of the Pb and 35-45% of the other three metals. Adsorption of metals (micrograms per g) in the batch systems was 150 for Pb and 35-40 for the other metals; in the columns, 83 for Pb and 16-33 for the other metals. (Cassar-FRC)
W83-03157

MOLECULAR SIZE DETERMINATION OF CHLOROFORM PRECURSORS,
Iowa Univ., Iowa City. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W83-03187

WATER MANAGEMENT FOR PACKAGED BOILER SYSTEMS,
G. S. Solt.
Effluent and Water Treatment Journal, Vol 22, No 7, p 259, 261, 263, 265, July, 1982. 1 Fig, 1 Tab.

Descriptors: *Boiler water, *Water quality, *Water conditioning, Water treatment, Blowdown, Ion exchange, Water softening, Reverse osmosis, Demineralization, Corrosion control, Scaling, Oxygen removal, Steam.

Factory-built packaged boilers tolerate a small margin of error in operation because of intensive use of the heat transfer surface. Total dissolved solids, hardness, silica, and suspended solids must be controlled within acceptable limits. Management methods are available for this purpose. First, design and operation should aim for the smallest possible volume of blowdown that is economical. Several processes are available for treating makeup water: lime softening, reverse osmosis, and modifications of ion exchange processes (base exchange, dealkalization-base exchange, sodium-hydrogen blend, and demineralization). Choice of the most suitable treatment depends on the raw water quality, the costs of energy and chemicals, the amount of condensate return, boiler water limits, and the substances added by conditioning chemicals. Use of conditioning chemicals depends on raw water quality and the degree of oxygen removal, scale prevention, corrosion inhibition, and foam reduction required. A sensible water management program must be based on the needs of the individual system as a whole. (Cassar-FRC)
W83-03205

GAMEKEEPER, POACHER--THE WELSH WA APPROACH,
D. G. Walker.
Effluent and Water Treatment Journal, Vol 22, No 7, p 268-269, 271-273, July, 1982. 3 Fig, 10 Ref.

Descriptors: *Monitoring, Welsh Water Authority, Water quality control, Pollutant identification, Standards, Legal aspects, *Wales.

Regional water authorities, established in the United Kingdom in 1974, were charged with conflicting duties: to maintain water services and to exercise a regulatory function over these services. The Welsh Water Authority organized a three-team water quality audit group, directly responsible to the director of scientific services. The North, Southeast, and Southwest each have a five-member audit team responsible for an impartial independent assessment of potable water quality, treatment plant performance, and surface (tidal and fresh) water quality. Each audit team monitors 2 or 3 divisions. Although each division has first claim to investigate water quality problems, the audit team may initiate investigations in case of conflict. Audit samples are not analyzed by divisional personnel. Flexibility is important in scheduling work so that routine surveillance may be dropped in favor of higher priority pollution investigations, if necessary. At present the audit teams are biased toward the potable water supply. Three years' experience has shown that the audit teams' reports carry considerable weight. Handling of water quality problems can be expedited through the audit teams' direct link with the director. The competitive spirit between audit teams and divisions has stimulated both parties to make best use of their resources. (Cassar-FRC)
W83-03219

HOW PULSATORS AND SUPERPULSATORS CAN IMPROVE THE WATER TREATMENT PROCESS,
Societe Degremont, Rueil-Malmaison (France).
Z. Mardirossian.
Water and Pollution Control, Vol 120, No 5, p 20, September, 1982. 2 Fig.

Descriptors: *Water treatment, *Pulsators, *Equipment, Water purification, Drinking water, Potable water, Design criteria, Engineering.

The Pulsator and the Super-Pulsator Clarifiers are high-rate sludge blanket type units specifically designed to combine coagulation, flocculation and sedimentation in one unit. The Pulsator Clarifier requires extremely limited maintenance, offers a reduction in the percentage of suspended and colloidal matter in the raw water which is impossible to achieve by other methods, has high sludge concentrations and low water losses, has outstanding operational simplicity and flexibility, consumes small amounts of energy, and offers uniform distribution of raw water and collection of clarified water over the whole area of the tank. Thus the system combines the advantages of an expanding sludge blanket with the technology utilizing inclined parallel plates within the sludge blanket. Flat sloping plates equipped with defectors are actually located within the sludge blanket to further aid sludge recirculation and increase concentration. (Baker-FRC)
W83-03220

WATER PLANT GROWS BIGGER, CUTS ELECTRIC BILL.
Water/Engineering and Management, Vol 129, No 13, p 29-30, December, 1982.

Descriptors: *Water treatment facilities, *Mixing, *Mechanical equipment, Water treatment, Cost analysis, Chemical treatment, Design criteria, *Arizona, Phoenix, Mesa.

The Val Vista Water Treatment Plant, which is jointly owned by the cities of Phoenix and Mesa, Arizona, has undergone changes to expand its capacity. One of the principal components of its upgrading was the installation of an in-line motionless mixer. The mixer, designed by Komax Systems, Incorporated, of Long Beach, serves to dose aluminum sulfate and chlorine into raw water after clarification during the water treatment process. It consists of a series of interlocking left-and right-handed mixing elements which, under turbulent flow, produce elliptical vortices rotating in opposite directions on either side of each element. The mixer produces a back-mixing effect that disperses the chemicals, which are added through several spargers, evenly and rapidly. The 20-ft-long unit is fabricated of carbon steel and is bolted to the concrete channel. After mixing, the chemicals are settled out by flocculation, and the water is sent to holding reservoirs or distribution systems. Cost analyses based on several months of operation show that the new mixer has significantly reduced costs. The Komax unit requires no additional energy to operate and virtually no maintenance, since it has no moving parts. The new unit also produces no noise, which greatly improves the work environment. (Geiger-FRC)
W83-03226

MOTHER NATURE AS SLUDGE THICKENER,
Onondaga County Metropolitan Water Board, Syracuse, NY.
C. Canfield, and R. L. Sutphen.
Water/Engineering and Management, Vol 129, No 13, p 22-24, December, 1982.

Descriptors: *Water treatment, *Filtration, *Sludge thickening, *Freeze-thaw tests, *Alum sludge, Economic aspects, Dewatering, Coagulation, Freezing, Pilot plants, Separation techniques, *New York.

The Onondaga County Metropolitan Water Board has significantly upgraded its water treatment plant at the Lake Ontario Filtration Plant by combining an unconventional backwash system that relies on natural freezing and thawing cycles to dewater alum sludge with an innovative filtration system using water from Lake Ontario. The project was undertaken after the modification of a discharge permit which required reduction of suspended solids discharged into Lake Ontario. The conversion to high-rate direct filtration would allow an economical expansion of the plant without further construction. A testing process for direct filtration was started, along with trials for a method of handling process wastes from the backwash. To handle solids separation, the two existing detention lagoons were modified to hold consecutive backwashes of the filters at a rate of 22 mgd. A sludge pumping system built by the Crisafulli Pump Company was selected to handle sludge removal. Freeze thaw tests were conducted for studying sludge separation. Regardless of the pumped sludge's concentration, it separated into sludge and clear supernatant upon freezing. Two additional freeze beds were constructed to handle the anticipated sludge quantities. During 1981, about 75,000 cu ft of sludge were successfully removed from the lagoons and placed in the freezing/thawing beds. The permanent facilities have reduced personnel, time, and cost, and were installed at a capital cost of less than $300,000. (Geiger-FRC)
W83-03227

PRECHLORINATION AND TRIHALOMETHANE FORMATION AT WATER TREATMENT,
Ontario Ministry of the Environment, Toronto.
A. H. Vajdic.
Water and Pollution Control, Vol 120, No 5, p 29-31, 45, September/October, 1982. 1 Tab, 12 Ref.

Descriptors: *Drinking water, *Chlorination, *Trihalomethanes, Disinfection, *Water treatment, Purification, Potable water, Canada, Toronto, *Ontario, Metropolitan water management, Water management, Bacteria, Coliforms.

The effect of removing prechlorination steps from the treatment of drinking water with respect to both the microbiological quality of the water produced and the trihalomethane content of that water was examined. Three Metropolitan Toronto water plants were included in the study. Measurements were made in three phases: first, while pre-chlorination was being conducted as usual; second, while pre-chlorination had been discontinued; and third, when prechlorination procedures were once again established. The total bacterial count in the filtered water was higher during the phase where pre-chlorination was not carried out. Indicator bacteria such as coliforms, fecal coliforms and fluorescent Pseudomonas species were reaching the final chlorination stage of treatment during this period of no prechlorination. This would necessitate a very stringent control at the final chlorination stage. The THM production appeared to be lower on the average in the absence of pre-chlorination, but the omission of the pre-chlorination stage should only be considered where properly designed chlorine contact facilities are available to ensure adequate retention times during final disinfection. (Baker-FRC)
W83-03228

THE ZURICH WATER SUPPLY SYSTEM,
M. Schalekamp.
Water Services, Vol 86, No 1038, p 366-370, August, 1982. 2 Fig.

Descriptors: *Water supply, *Drinking water, *Groundwater, *Lakes, Wells, Spring water, Zurich, *Switzerland, Water resources development, Potable water.

Zurich obtains its drinking water from three sources, the Lake of Zurich, groundwater, and springwater. The heaviest reliance is on lakewater; two plants have been built to extract and treat it. Groundwater is extracted at Hardhof at a rate of up to 150,000 m/d by means of four horizontal filter wells. Spring water comes from 123 springs in the Sihl and Lorze valleys, contributing a total daily production of 20,000-30,000 cubic meters. The water passes through the following treatment stages: flocculation, rapid filtration, ozonation, activated carbon filtration, slow filtration, neutralization and disinfection. A computer-based operation has been devised to simplify and improve the operational reliability of the plant. (Baker-FRC)
W83-03229

FIT TO DRINK,
Yorkshire Water Authority (England).
W. M. Jollans, and T. Zabel.
Water, No 43, p 7-9, March, 1982.

Descriptors: *Water treatment, *Municipal water, Technology, Lead, Nitrate, Organic compounds, Water quality management, Automation, *United Kingdom.

The British Standing Technical Committee on Water Treatment has produced a final report entitled 'Fit to Drink'. This report deals primarily with the progress of research with respect to health related aspects of water supplies, focussing on the operational side of water treatment practice and, in particular, on the instrumentation, control, and automation of water treatment processes. Problems related to lead in drinking water and remedial measures for addressing these problems are discussed. Increasing nitrate concentrations and methods of nitrate removal are examined. Problems relating to organics and micropollutants in water supplies are reviewed. The need to improve the treatment of small public water supplies is discussed. Differences in water treatment practices on the continent and in the United Kingdom are identified. Problems which can arise from large scale water transfers and other changes in water source are described and methods of minimizing risks are outlined. Advantages and disadvantages of instrumentation, control, and automation are discussed. (Carroll-FRC)
W83-03236

WATER AND SEWER SYSTEM MODELLING USING A MICRO-COMPUTER SYSTEM,
Surrey District, Vancouver (British Columbia).
K.-B. Lee.
Water and Pollution Control, Vol 120, No 4, p 10, 43, July/August, 1982.

Descriptors: *Model studies, *Computers, *Sewer systems, Sewers, Wastewater disposal, Flows, Mathematical equations, Water distribution, *British Columbia, Vancouver.

Surrey is a large, rapidly growing municipality located on the outskirts of Vancouver. As a result of rapid urbanization, an enormous demand was placed on the municipal servicing system. To solve various problems to Surrey Engineering Department decided to develop computer models of servicing systems, especially water and sanitary sewer systems. A cost-benefit systems analysis was performed to answer two major questions: which microcomputer among the many available was best to have, and what computer programs could be implemented on microcomputers and meet the modelling requirements. The distribution system under study consists of 950 km of water mains. Due to the topographic situation the water system is currently divided into 22 zones by a number of isolating and pressure reducing valves. The computer as designed provides the area engineers with residual pressures on water distribution networks for various water demand and system pressure conditions. Also, it provides the department with capacity of sewers, estimated peak and average sewage flows, and corresponding flow velocity and depth. (Baker-FRC)
W83-03243

WINTER OF FROSTS, FLOODS AND BURSTS.
Water, No 43, p 2-5, March, 1982.

Descriptors: *Frost, *Floods, Weather, Water management, Water mains, Water conveyance, Water demand, Water delivery, *United Kingdom.

The winter of 1981-1982 brought severe weather, which presented a variety of problems for water authorities throughout the United Kingdom. A very high tide, combined with a force 10 gale, caused a tidal surge and wave action which breached sea defenses and caused flooding in several areas early in December, 1981. This was followed by the worst freeze-up in living memory, with record low temperatures causing a wave of burst water mains throughout the country. In many water authorities, there were ten times as many bursts per day as experienced in previous years. In addition, thousands of private homes reported burst pipes. These leaks, combined with the effects of many consumers leaving taps running at night to prevent freezing of pipes, placed considerable strain on water reserves. In several locales, water demand was at levels normally only experienced in summer months. Subsequent thawing in early January resulted in flooding, with many areas experiencing 10 year flood levels. (Carroll-FRC)
W83-03244

VALVES, PENSTOCKS AND ACTUATORS: RELIABLE CONTROL OF WATER SYSTEMS,
H. E. Jordens.
Water Services, Vol 86, No 1032, p 63-64, February, 1982.

Descriptors: *Water management, *Automation, Water treatment facilities, Water conveyance, Water quality management, Metropolitan water management, *United Kingdom.

Several water authorities in the United Kingdom are using valves and Westinghouse Data Acquisition and Control (Wesdac) equipment and softwater produced by Westcode Systems as integral components of water supply monitoring and control systems. These components include multiport spool valves, the Derion blowing seal, and distributed processing systems. The multiport spool valves can be used as the flow selection mechanism in an on-line effluent quality monitoring system. The blowing seal, which is one of the range of rotary vane valves manufactured by Westcode Systems, is used by several water authorities to control the flow of lime and soda ash between a storage silo and a positive or negative pressure pneumatic conveying system. This valve can be fitted with a variable speed motor in order for it to act as a metering unit. The distributed processing systems in the Wesdac range of supervisory control equipment and software comprise a single or dual mini-computer based control center connected to a number of microprocessor based remote terminal units by a serial communication circuit. The control center provides overall strategic plant control, historic data storage and trend displays for long term management information, and such other functions as statistical analysis and modelling. The contral operator can use a visual display unit and associated keyboard to manually control the status or performance of individual items or groups of operations. Potential areas for expansion of automated control facilities are under active study. (Carroll-FRC)
W83-03245

WATER SUPPLY FOR THE LIZARD.
Water Services, Vol 86, No 1038, p 393-394, August, 1982. 1 Fig.

Descriptors: *Water supply, *Water treatment facilities, Wendron Water Works, Rivers, Water quality, Water resources development, Intakes, *United Kingdom.

A new Wendron Water Treatment Works supplying the Lizard Peninsular area was officially opened in June of 1982, with almost four times the capacity of the works it replaced. A new river intake was provided near the site of the original, with the advantage of coping with flows supplemented by pipeline from the Stithians reservoir. Several modern engineering concepts were embodied in the scheme, including Superpulsator clarification for a high standard of treatment, computer control of the entire system, and use of the latest type of variable speed pumps for maximum energy conservation. The new intake is just below the confluence of the River Cober and Releath Stream. A crump weir has been provided to give adequate means of measuring abstraction and regulation flows. The treatment system incorporates inlet mixing followed by chemical dosing using aluminum sulfate as the main coagulant. A coagulant aid, lime for pH correction and provision for powdered carbon when taste and odor problems occur are provided. The whole works can be controlled and monitored automatically. (Baker-FRC)
W83-03246

THE ROLE OF CATIONIC SURFACTANTS IN THE RENOVATION OF WATER,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
D. W. Weeter, and K. L. Roberts.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-219790. Water Resources Research Center Research Report No 87, Univ. of Tennessee, Knoxville, June 1983. 225 p, 17 Tabs, 92 Fig, 77 Ref. OWRT B-045-Tenn(1), 14-34-9096.

Descriptors: *Cationic surfactants, Pollutants, Potable water, Water renovation, *Coagulants, Floc, *Dewatering, Disinfection, Clay, Sludge, *Surfactants, *Wastewater treatment, Water treatment, Jar test procedures, Adsorption.

The objectives of this research project are, as quoted from the proposal: (1) to examine the kinetics and effectiveness of disinfection with cationic surfactants, (2) to characterize the use of cationic surfactants as coagulants and coagulant aids in raw water treatment, (3) to describe the ability of cationic surfactants to remove trihalomethane precursors (humic and fulvic compounds) from water, (4) to determine the ability of surfactant-induced floc to adsorb nonpolar organic compounds from water and, (5) to examine the dewatering charac-

teristics of surfactant-induced floc particles. Jar test procedures were utilized to obtain most results. It was demonstrated that cationic surfactants are extremely effective bactercides against two common organisms, one of them pathogenic. It was demonstrated that cationic surfactants are extremely effective coagulants of particulate matter (clay) and color. It was demonstrated that surfactant-induced clay floc does adsorb organics but that the process is severely limited. It was demonstrated that cationic surfactant-induced floc particles are highly hydrophobic and have specific resistances several orders of magnitude lower than those of alum floc particles produced under similar conditions. Most of the results have exceptional significance to the water treatment industry. The cationic surfactant treatment process removes particulate matter and soluble molecules such as humic acid and lignin; the sludge produced is highly hydrophobic, which means that it is easy to dewater and settles to a very small volume. Any organisms in suspension are inactivated.
W83-03275

REMOVAL OF NITRATE, SULFATE AND HARDNESS FROM GROUNDWATER BY ION EXCHANGE,
Iowa State Water Resources Research Inst., Ames.
J. L. Musterman, D. W. Swailes, T. J. Laford, and D. A. Bergo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220335, Price codes: A06 in paper copy, A01 in microfiche. Completion Report No 112, February 1983. 111 p, 30 Fig, 13 Tab, 46 Ref. OWRT A-075-IA(1), 14-34-0001-0117.

Descriptors: *Nitrates, *Sulfates, *Hardness, Mathematical models, Design criteria, Drinking water, *Ion exchange, *Water treatment, Resins, Anion resins, Groundwater.

Removal of nitrate, sulfate and hardness with strong base resins is possible. The purpose of this study was to determine the effects of nitrate and sulfate loading on regeneration efficiency of strong base anion exchange resins and to develop design criteria for nitrate and sulfate removal. An empirical model to predict regeneration requirements for strong base anion exchange resins for nitrate removal was developed and verified. Extensive laboratory test using various exchange resins were used to verify the model. A second model was developed to predict the length of time for exhaustion of the resin as a function of loading. Several anion resins were evaluated for nitrate removal. No significant difference in the regeneration efficiencies between resins was observed.
W83-03290

THE FATE OF ANTIFOULANT ORGANOTIN COMPOUNDS IN WATER SYSTEMS,
District of Columbia Univ., Washington. Coll. of Physical Science, Engineering, and Technology.
For primary bibliographic entry see Field 5B.
W83-03315

A NOVEL BACTERICIDAL AGENT FOR TREATMENT OF WATER,
Auburn Univ., AL. Dept. of Chemistry.
S. D. Worley, W. B. Wheatley, H. H. Kohl, H. D. Burkett, and J. H. Faison.
In: Proceedings 4th Conference on Water Chlorination: Environmental Impact and Health Effects, Pacific Grove, CA, Oct 18-23, 1981. Vol 4, Book 2, Ann Arbor Science Publishers, 1982. p 1105-1113, 2 Fig, 1 Tab, 10 Ref. Jolley, R. L., et al., ed. OWRT A-072-ALA(4), 14-34-0001-9001.

Descriptors: Chemical reactions, Treatment, *Water purification, *Water treatment, Chlorine, *Disinfection, Water quality, *Chlorination, Bactericides, Wastewater treatment.

Although chlorination remains the most used method for disinfection of public water supplies, several factors detract from the desirability of chlorine gas as a bactericidal agent. The chloramine agent 3-chloro-4, 4-dimethyl-2-oxazolidinone (Agent I) has been tested as a bactericide for the disinfection of water. It kills E. coli in water in a concentration range (equivalent 5 mg/L), which is comparable to that used in standard chlorination in treatment plants. Other bacteria are also destroyed by Agent I, although generally requiring higher concentration levels. In a laboratory-scale water treatment plant, Agent I produced bacteria-free water when used in conjunction with a 15-ft sand filter. Preliminary toxicity data indicate that Agent I and its decomposition products are relatively nontoxic. Agent I is a stable solid and, as such, could not lead to catastrophic accidents in treatment plants or during public transportation. Furthermore, in water solution, Agent I releases chlorine only on demand and thus remains stable in solution for extended periods. Given that chloramines do not tend to produce toxic haloforms in water as does chlorine gas, and the other advantages of Agent I cited above, we believe that Agent I represents a realistic alternative to chlorine gas for use in water disinfection if it can be produced at a reasonable cost.
W83-03337

UV-OZONE PROCESS FOR THE CONCURRENT DECOMPOSITION OF HALOGENATED ALKANES AND THE DISINFECTION OF WATER,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
C. P. C. Poon, and B. M. Vittimberga.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222364, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Center Technical Report No 10, December 1982. 22 p, 5 Fig, 5 Tab, 10 Ref. OWRT A-076-RI(1), 14-34-0001-1142.

Descriptors: *Ultraviolet radiation, *Ozonation, Kinetics, Optimization, Coliforms, *Disinfection, *Water treatment.

The use of ozone in combination with ultraviolet radiation is studied as a treatment process for the removal of chloroform and bromodichloromethane from drinking water. A first order removal kinetic is found. Treatment with UV radiation alone with 10.6 w/1 power input and 15,800 uw sqcm intensity is found to be ineffective for $CH3C\overline{1}3$ removal. In a mixture of the two compounds, each breaks down independently at its own rate by removing both $CHC\overline{1}3$ and $CHBrC\overline{1}2$ individually or in combination. Air purging experiments using a flow rate identical to the ozone gas flow treatment is more effective than the combination of the individual removals by ozone and by UV radiation. The result of this study also shows that with 10.6 w/1 power input of UV radiation and 6.4 mg ozone/min dosing rate, a removal of coliform (100%) is consistently obtained with 30-minute exposure.
W83-03338

CAUSES OF LOCALIZED COPPER CORROSION IN DRINKING WATER SUPPLIES,
Arkansas Univ. at Little Rock. Dept. of Electronics and Instrumentation.
R. A. Sims, and R. W. Raible.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222448, Price codes: A02 in paper copy, A01 in microfiche. Water Resources Research Center Publication No 94, Univ. of Arkansas, Fayetteville, May 1983. 11 p, 14 Ref. OWWR A-043-ARK(1), 14-34-0001-8004.

Descriptors: *Copper, *Corrosion, *Potable water, *Taste, Corrosion control, Water quality, Impaired water quality, *Arkansas, Lake DeGray, Arkadelphia.

Excessive amounts of copper have been observed in drinking water at certain installations on Lake DeGray and at isolated locations in the Arkadelphia area of Arkansas. A study of these installations was conducted to determine the source of the copper contamination. The supply water was very low in copper and therefore dissolution of the copper plumbing caused by low water pH and long residence times was determined to be the most probable source.
W83-03346

OPTIMIZATION AND DYNAMIC CONTROL OF THE COAGULATION PROCESS IN WATER TREATMENT,
New Hampshire Univ., Durham. Water Resources Research Center.
P. J. Ossenbruggen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-224220, Price codes: A04 in paper copy, A01 in microfiche. Research Report No 40, May 1983. 58 p, 16 Fig, 8 Tab, 31 Ref, 1 Append. OWRT B-005-NH(4), 14-34-0001-9122.

Descriptors: *Optimization, Dynamic, *Coagulation, *Water treatment, *Color, *Turbidity, Temperature, Mechanical mixing, Time series analysis, Alum treatment.

Water quality variables, color, turbidity, and temperature, show pronounced variations with time. These dynamic characteristics have a dramatic impact upon the treatment of these waters for human consumption. The purpose of this work is to identify the factors that can be introduced into a strategy for optimally removing color and turbidity from raw waters. A series of jar tests on color-turbidity samples and natural water samples show that color is the critical factor in determining the critical chemical dose for maximum color and turbidity removal. The effects of temperature and mechanical mixing were also investigated and reported. With the use of time series methods, a dynamic control strategy for treating surface waters with alum was developed. These studies show the strategy is economical and effective in reducing the risk of underdosing.
W83-03373

EFFECT OF IRON AS A TRACE IMPURITY ON THE WATER SOFTENING PROCESS,
Iowa State Univ., Ames. Engineering Research Inst.
R. W. Peters, and J. D. Stevens.
AIChE Symposium Series, Vol 78, No 215, p 46-67, 1982. 14 Fig, 8 Tab, 27 Ref.

Descriptors: Water quality, *Water softening, *Iron, Kinetics, Chemical reactions, Crystallization, *Water treatment.

Experimental studies were performed to determine the precipitation kinetics of the combined calcium carbonate-magnesium hydroxide system, both in the pure system and in the presence of trace quantities of iron. A brief review of the water chemistry, steady state crystallization theory, and effect of impurities is presented. The kinetics of simultaneous calcium carbonate and magnesium hydroxide precipitation are sensitive function of pH. The growth rate, nucleation rate, and kinetic order were measured for various alkalinity distributions and various iron concentrations. Iron can be removed through the use of the lime/soda-ash water softening process forming insoluble iron precipitates, which are amorphous in nature. The removal of the iron is strongly pH dependent. The iron, acting as an impurity to the system, markedly affects the amount of wall deposition. The iron caused a slight inhibition of the growth rate, but greatly enhanced the nucleation rate. The crystal growth rate of the calcium carbonate-magnesium hydroxide precipitate decreases with increasing iron concentration. The growth inhibition contributes to the formation of a bundle crystal structure for the aragonite precipitate.(Baker-FRC)
W83-03411

TRIHALOMETHANE REMOVAL AND FORMATION MECHANISM IN WATER,
Howard Univ., Washington, DC. Dept. of Chemical Engineering.
R. C. Chawla, M. M. Varma, A. Balram, M. M. Murali, and P. Natarajan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-224410, Price codes: A04 in paper copy, A01 in microfiche. District of Columbia Water Resources Research Center Publication No 48, Univ. of the District of Columbia, May 1983. 54 p, 21 Fig, 2 Tab, 12 Ref. 3 Append. OWRT A-021-DC(1), 14-34-0001-2109.

Descriptors: Trihalomethane removal, Trihalomethane adsorption, *Water treatment, Trihalomethanes, Gas chromatography, *Activated carbon, Batch removal, Continous removal, Adsorption.

Trihalomethane (THM) formation kinetics and removal by Granulated and Activated Carbon (GAC) were studied. The formation studies showed that about 90% of the total trihalomethanes (TTHM) formed is chloroform and the other 10% included the remaining three (THM's, namely CHCl sub 2 Br, ChBr sub 2 Cl and ChBr sub 3. The THM formation rate decreases with time and the formation potential of TTHM increases nonlinearly with the chlorine dosage. Over a wide range of solids (precursor) concentrations (15-150 mg/l), the mechanism of THM formation appears to remain unchanged. Similar results were also observed for chlorine concentration over a range of 2-15 mg/l. A simple kinetic model was applied to the data and a reaction order of 0.3 was calculated for chlorine concentration in the THM formation rate. THM removal was studied using both batch and continuous methods, Freundlich adsorption Isotherms fit the batch data very well. 86-97% removal of THM was observed over a period of 1-8 days. In continous method, the % removal dropped significantly when carbon dose was reduced. The removal efficiences were generally much lower for continuous method than for batch method.
W83-03430

MONITORING FLOCCULATION IN WATER TREATMENT USING A COMPUTER-CONTROLLED PHYSICAL MODEL (UBERWACHUNG DER WASSERAUFBEREITUNG MIT HILFE EINES RECHNERGESTEUERTEN PHYSIKALISCHEN MODELLS),
DECHEMA, Frankfurt am Main (Germany, F.R.).
K. Ahrens, and V. G. Gunderlach.
Gas- und Wasserfach: Wasser/Abwasser, Vol 123, No 123, No 3, p 131-138, March, 1982. 9 Fig, 9 Ref. English abstract.

Descriptors: *Flocculation, *Drinking water, Model studies, *Optimization, *Computer models, Computers, *Water treatment, Mathematical models, *Federal Republic of Germany.

Flocculation is an important step in the conversion of polluted surface waters into drinking water. When raw water quality and operating costs are constant, the performance of a flocculation plant depends not only on the design parameters but also on the process variables such as flocculant concentration. Process variables for a particular sludge contact process can be derived from a microcomputer controlled physical model, which is of similar design and operates in parallel to the large scale plant. The automatic optimization can be selected to tend toward either the technical optimum (maximum water quality) or the economic optimum. Variation of the flocculant to flocculation-aid ratio is suggested for further cost savings. This suggestion is based on a mathematical model, the parameters of which have been experimentally determined for a simple flocculation system (drinking water/china clay). (Author's abstract)
W83-03439

PROMISING EXPERIMENTS ON LEAK LOCATION BY MEANS OF CORRELATION (AUSSICHTSREICHE VERSUCHE ZUR LECKORTUNG MITTELS KORRELATION),
Stuttgart Univ. (Germany, F.R.).
C. Laske, D. Weimer, and H. V. Fuchs.
Gas- und Wasserfach: Wasser/Abwasser, Vol 122, No 3, p 112-115, March, 1981. 6 Fig, 2 Ref. English abstract.

Descriptors: *Water conveyance, *Networks, *Leakage, *Correlation analysis, *Water loss, *Leak location, Leak detection, Mathematical analysis, Measuring instruments, Mathematical equations, Water distribution, Water mains, Conveyance structures, Pipes.

The Stuttgart Technical Works (STW) and the Fraunhofer Institute for Construction Physics (FICP) have conducted a project to locate leaks in a water conveyance network using correlation analysis since 1979. As in the conventional method of locating leaks, the correlation technique utilizes sound. However, instead of relying on the intensity of the sound produced by the leak, the correlation method uses a difference in transmission time of soundwaves at two measuring stations, one on either side of the leak. In addition, the sound level of the leak noise can lie beneath that of ambient noise, since the latter is taken into account in the correlation equation; and the recognition of a leak noise by a characteristic sound spectrum is unimportant, so that the subjective experience of a 'listener' can be replaced by a series of objective indications. Two-point cross correlation is used to detect a leak, which signals its presence by producing a marked maximum transmission time difference visible on an oscillograph attached to the correlation device. Both the equation for the calculation of the correlation coefficient and an equation to calculate the distance of the leak from the measuring station are given. STW has designed a mobile measuring station, a van equipped with devices for combined leak analysis and location, a universal recording apparatus to plot pressure and volume, an inductive flow volume-measuring device and electronic network pressure gage with digital display, space-saving hydraulic equipment, and an independent electricity supply. The STW/FICP tested 400 km of water conveyance network in under two years and uncovered annual losses of 1.8 million cu m. Of the leaks, 17% (30% of volume lost) were in distribution pipes, 37% (11%) in fittings (e.g., hydrants), and 46% (59%) in connecting pipes. (Gish-FRC)
W83-03445

TOPICAL QUESTIONS ON CENTRAL CONTROL AND MONITORING FOR WATER SUPPLIES (AKTUELLE FRAGEN BEI ZENTRALER STEUERUNG UND UBERWACHUNG VON WASSERVERSORGUNGEN),
Ingenieurburo Grombach G.m.b.H., Bad Homburg (Germany, F.R.).
J. Franz.
Gas- und Wasserfach: Wasser/Abwasser, Vol 122, No 2, p 45-52, February, 1981. 5 Fig, 3 Tab, 7 Ref. English abstract.

Descriptors: *Water conveyance, *Automation, *Cost-benefit analysis, *Process control, *Computers, Federal Republic of Germany, Data processing, Computer programs, Design criteria, Costs, Capital costs, Planning, Long-term planning, Utilities, Operating conditions, Water distribution.

Questions to be considered regarding the installation of a central control and monitoring facility for water supply centers cannot usually be answered for the industry as a whole; specific technical and operating conditions for each plant are the deciding factors. For operating conditions, questions to be considered include choice of facility design, cost-benefit ratio, whether multiple utilities (e.g., water and gas) should share the facility, whether a process control computer is needed (and if so, whether one or two computers should be installed), the choice of operating display panel, and programming problems. When deciding on design, long-range goals must be considered to avoid building a system that will soon be inadequate. (Gish-FRC)
W83-03449

BERLIN WATER '81 -- 125 YEARS OF CENTRAL WATER DISTRIBUTION (WASSER BERLIN '81 -- 125 JAHRE ZENTRALE WASSERVERSORGUNG),
Berliner Entwasserungswerke (Germany, F.R.).
H. Teesendorff.
Gas- und Wasserfach: Wasser/Abwasser, Vol 122, No 3, p 97-102, March, 1981. 3 Fig, 9 Ref. English abstract.

Descriptors: *Water conveyance, *Wastewater treatment, *Water treatment facilities, *Wastewater facilities, *History, Federal Republic of Germany, *Berlin, Water quality control, Automation, Water distribution, Groundwater, Drinking water, Groundwater recharge, Eutrophic lakes, Tegeler See, Water demand, Water pollution, Spree river.

The first water works in Berlin (Federal Republic of Germany) began operation in 1856, and wastewater disposal began in 1878. At the beginning of the 20th century, methods of removing iron and manganese compounds permitted the use of groundwater for drinking, and the city was enabled to eliminate the use of surface water for this. By 1939, the city, together with a private company, supplied 4.3 million residents with 230 million cu m water per year. When the city was split in 1949, West Berlin was left with only 7 of the 16 waterworks, which supplied < 500,000 cu m/day, to supply two-thirds of the original city residents. The capacity of the seven waterworks is now 1,140,000 cu m/day; the pure water storage capacity was expanded from 185,000 to 370,000 cu m, and the sewer system increased from 3,777 to 4,500 km. Since 1949, about 880 million DM has been spent on the water supply system, approximately half of this in the last 10 yr. The city expectes to cover demand for some time, since demand is projected to rise < 1% in the next 10 yr. Mechanization is continually being instituted, though only one facility (Kladow) is fully automated with process control (other facilities are partially automatic). All Siphon wells were converted to run under their own power between 1964 and 1980, and the number of pumps was reduced about 1,000 to 406, even though pumping capacity increased twofold since 1950. The use of groundwater for drinking is made possible by favorable hydrogeology: sand and gravel deposits provide large quantities of good-quality water. Artificial recharge is conducted by means of percolation basins; up to 30 million cu m of mechanically treated surface water per year is returned to the ground, and this amount will eventually be increased to 70 cu m/yr. (Gish-FRC)
W83-03455

DEVELOPMENT AND STATUS OF EMERGENCY DRINKING WATER SUPPLY IN THE FEDERAL REPUBLIC OF GERMANY AFTER PASSAGE OF THE WATER SAFEGUARDING LAW (ENTWICKLUNG UND STAND DER TINKWASSER-NOTVERSORGUNG IN DER BUNDESREPUBLIK NACH DEM WASSERSICHERSTELLUNGSGESETZ),
Wahnbachtalsperrenverband, Siegburg (Germany, F.R.).
W. Such, and W. Hampel.
Gas- und Wasserfach: Wasser/Abwasser, Vol 122, No 9, p 402-410, September, 1981. 5 Fig, 1 Tab, 12 Ref. English abstract.

Descriptors: *Water supply, *Civil defense, *Water law, *Governmental interrelations, Legal aspects, Political aspects, Interagency cooperation, *Public health, *Drinking water, Wells, Pipelines, Urban areas, Federal Republic of Germany.

The Federal Republic of Germany is required by law to provide the public with an emergency water supply during times of war or other disruptions. In compliance with the Law on Safeguarding Water Supply, approximately 3528 solitary wells have been constructed or reconstructed, independent of the public water supply. The program, Emergency Water Supply by Wells and Springs, went into effect on December 31, 1979 and serves most large cities an urban areas (about 14.93 million inhabitants). The Federal Ministry of the Interior has ordered the construction of interconnecting emergency pipelines with a total length of about 390 km at a cost of 105.6 million DM as part of the water program within the Federal investment program. (Author's abstract)
W83-03458

POSSIBILITY OF REDUCING ENERGY COSTS FOR WATER CONVEYANCE USING A PRELIMINARY RESERVOIR (EINSPARMOGLICHKEIT AN ENERGIEKOSTEN ZUR WASSERFORDERUNG DURCH EINSATZ EINES VORBEHALTERS),
For primary bibliographic entry see Field 8A.
W83-03459

USE OF POLYETHYLENE IMINES IN FLOTATION AND IMPROVING THE FILTRATION OF SUSPENSIONS OF BLUE-GREEN ALGAE,
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
N. C. Volkova, N. V. Khominskaya, V. M. Grashchenko, and S. A. Azoyan.
Hydrobiological Journal, Vol 18, No 1, p 59-63, 1982. 3 Tab, 3 Ref.

Descriptors: *Algae, *Polyethylene imines, *Filtration, *Water treatment, Cyanophyta, Flotation, Flocculation, Organic compounds, Algae harvesting.

Polyethylene imines (PEI) with molecular weights of 30,000 to 80,000 were tested as flotation-filtration aids for water containing cyanophytes. Filtration was somewhat faster with the 30,000 and 60,000 molecular weight PEI than with the 80,000 molecular weight PEI. Most effective was the 60,000 molecular weight PEI. Optimum concentration of PEI for filtration was 5-10 mg per liter of suspension. Optimum concentration of algal dry matter for filtration was 6-10 g per liter. Floc formation took place immediately after addition of PEI. (Cassar-FRC)
W83-03471

DRINKING WATER CONTAMINATION WITH CHLORO-ORGANIC COMPOUNDS: SOURCES, HEALTH EFFECTS, CONTROL (CONTAMINAZIONE DELLE ACQUE POTABILI DA COMPOSTI CLORO-ORGANICI: ORIGINE, EFFETTI BIOLOGICI, MISURE DI PROTEZIONE E DI CONTROLLO),
Milan Univ. (Italy). Inst. of Hygiene.
G. Ziglio, and A. Giovanardi.
Igiene Moderna, Vol 75, No 4, p 395-426, April, 1981. 2 Tab, 66 Ref.

Descriptors: *Chlorinated hydrocarbons, *Drinking water, *Water quality control, Hydrocarbons, Water quality, Water pollution sources, Water pollution prevention, Tricholoethylene, Chloroform, Pesticides, Chlorination, Trihalomethanes, Industrial wastes, Water treatment, Hazardous materials, Milan, *Italy.

US studies as well as those performed in Milan (Italy) have demonstrated the frequent contamination of drinking water sources with chloro-organic compounds. Compounds such as trichloroethylene, chloroform, and pesticides reach water supplies through their manufacture or industrial and agricultural use. Trihalomethanes are formed during the chlorination process. Some of these compounds are carcinogens, so there is no risk-free level. Thus, contaminated drinking water must be monitored, and pollution sources must be identified, contaminated wells reclaimed, and uncontaminated sources discovered. Emergency means for reducing chloro-organic levels are needed. In the case of trihalomethanes, the removal of precursors is possible as well as modifications in the chlorination process. Also, alternative disinfectants can be used. The removal of contaminating compounds before the water reaches treatment and distribution is effective but expensive. (Small-FRC)
W83-03476

PHYSICAL, CHEMICAL, AND BIOLOGICAL CHARACTERISTICS OF LAKE OMODEO, PART II: POSSIBILITY OF USING IMPOUNDED WATER FOR SUPPLYING ORISTANO CITY (FENOMENI BIOLOGICI DI UN LAGO ARTIFICIALE DI ANTICA DATA: LAGO OMODEO, NOTA II: SULLA POSSIBILITA DI UTILIZZARE LE ACQUE DELL'INVASO PER LA ALIMENTAZIONE IDRICA DELLA CITTA DI ORISTANO),
Cagliari Univ. (Italy). Ist. di Igiene.
A. Contu, A. M. Cioglia, G. Pinducciu, M. Schintu, and M. L. Lintas.
Igiene Moderna, Vol 77, No 2, p 216-227, 1982. 3 Tab, 4 Ref.

Descriptors: *Oil industry, Water pollution, *Lakes, Rivers, Chemical analysis, Water analysis, Toxicity, *Water pollution sources, Aqueducts, Water supply development, *Italy, Lake Omodeo.

Investigations of the physical, chemical, and biological characteristics of Lake Omodeo effluent were extended to determine possible pollution generated by Ottana petrochemical plants. Tirso lower course waters were also investigated as a possible alternative to feed the Oristano aqueduct. Chemical pollution was absent in the lake effluent and at low levels in the river. Lake water normally has better and more stable characteristics so it is preferable for the aqueduct. Controls on wastes from the Ottana plants are necessary to avoid toxic pollution of Omodeo. Direct utilization of lake water is advisable to avoid any further variability and the pollution of the lower Tirso. (Author's abstract)
W83-03477

5G. Water Quality Control

EFFECT OF AQUATIC MACROPHYTES ON PHYSICO-CHEMICAL PARAMETERS OF AGRICULTURAL DRAINAGE WATER,
Agricultural Research and Education Center, Sanford, FL.
K. R. Reddy, P. D. Sacco, D. A. Graetz, K. L. Campbell, and K. M. Portier.
Journal of Aquatic Plant Management, Vol 21, p 1-7, January, 1983. 5 Fig, 4 Tab, 15 Ref.

Descriptors: *Macrophytes, *Elodea, *Dissolved oxygen, *Agricultural runoff, *Physicochemical properties, *Water hyacinth, *Water quality control, Turbidity, Chemical oxygen demand, Water temperature, Water quality management, Hydrogen ion concentration, Alkalinity, Carbon dioxide, Biological oxygen demand, Conductivity.

The effect of aquatic macrophytes cultured in experimental reservoirs and flooded fields of the physico-chemical properties of treated and untreated agricultural drainage water was monitored over a period of 27 months. Allowing drainage water to flow through a reservoir stocked with waterhyacinths decreased dissolved oxygen (DO), temperature, pH, conductivity (EC), turbidity, and alkalinity, but increased dissolved carbon dioxide (CO_2). Drainage water flowing through reservoirs stocked with elodea or cattails exhibited increased DO, pH, temperature, CO_3 alkalinity and turbidity but decreased dissolved CO_2, HCO_3 alkalinity and EC compared with untreated water. Water flowing through reservoirs stocked with waterhyacinths showed marked decreases in biological oxygen demand and chemical oxygen demand compared with other treatment systems. In water flowing over flooded fields, DO, EC, pH and temperature were increased, but dissolved CO_2, HCO_3 alkalinity, and turbidity were decreased compared with untreated water. (Geiger-FRC)
W83-03153

EFFECTS OF SIMAZINE TREATMENT ON CHANNEL CATFISH PRODUCTION AND WATER QUALITY IN PONDS,
Delta Branch Experiment Station, Stoneville, MS.
C. S. Tucker, R. L. Busch, and S. W. Lloyd.
Journal of Aquatic Plant Management, Vol 21, p 7-11, January, 1983. 6 Fig, 1 Tab, 7 Ref.

Descriptors: *Herbicides, *Water pollution effects, *Aquatic weed control, *Water quality control, *Catfish farming, Aquatic weeds, Carbon dioxide, Dissolved oxygen, Nitrogen, Nitrite, Ammonia, Pesticides, Catfish, Fish farming.

The effects of a single simazine treatment (1.3 milligrams/liter) on channel catfish production and water quality was investigated in ponds infested with Chara vulgaris. Following herbicide treatment, dissolved oxygen levels decreased, and total ammonia-nitrogen, nitrite-nitrogen, and carbon dioxide levels increased. These effects were most pronounced the second week after treatment. Fish production was reduced 20% in treated ponds compared to control ponds, even though affected variables did not reach lethal limits. The single dose of simazine completely eliminated Chara infestations within 2 to 3 weeks. (Geiger-FRC)
W83-03167

PHYSIOCHEMICAL PRETREATMENT OF LANDFILL LEACHATES USING COAGULATION,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Chemical and Biochemical Engineering.
C. S. Slater, C. G. Uchrin, and R. C. Ahlert.
Journal of Environmental Science and Health, Part A, Vol 18, No 1, p 125-134, 1983. 4 Fig, 1 Tab, 20 Ref.

Descriptors: *Coagulation, *Industrial wastes, *Leachates, Turbidity, Polyelectrolytes, Wastewater treatment, *Landfills, Lime.

Lime was the most effective pretreatment coagulent for the aqueous phase of a high strength industrial landfill leachate of complex and undefined composition. A treatment with 6.0 g of lime per liter of leachate reduced turbidity of 130 NTU by 98%, total organic carbon of 9850 mg per liter by 6%, COD of 22,900 mg per liter by 10%, and iron of 200-2000 mg per liter by >99%. Studies with alum, ferric chloride, and magnesium oxide showed that none were as effective as lime. Addition of the polyelectrolyte Magnifloc 570 sharply increased the rate of turbidity reduction during the first 20 min of detention. Another leachate sample with a higher concentration of dispersed oil in the aqueous phase had a much slower rate of turbidity reduction even with addition of polyelectrolytes to the lime. After 10 min of settling, the anionic polyelectrolyte Primafloc A-10 plus lime reduced supernatant turbidity by 95% compared to lime alone, which gave a 9% reduction. Cationic polymers produced a 40-60% reduction with a detention time of 10 min. (Cassar-FRC)
W83-03172

HORSES IN SUBURBIA,
Fairfield County Conservation District, Monroe, CT.
K. Decker.
Journal of Soil and Water Conservation, Vol 38, No 1, p 21-22, January-February, 1983. 2 Fig.

Descriptors: *Animal wastes, *Erosion control, Horses, *Connecticut, Soil erosion, Wind erosion, Manure, Runoff, Groundwater contamination, Water quality.

The high horse population in Fairfield County, Connecticut, poses two threats to water quality in the area. The first concerns manure storage and disposal and the second concerns erosion and sedimentation from horse sites. To encourage good waste management and to mitigate or prevent potential pathogen contamination of soil and water resources, public health regulations require storage specifications, maintenance practices, and regular use of disposal procedures for horse manure. Watershed sanitation regulations prohibit accumulation of manure within specified proximities of reservoirs, watercourses, wetlands, and watersheds. The major problem caused by horse wastes occurs when such wastes become a source of nutrient pollution. As such horse wastes can enter wetlands, watercourses, ponds, and groundwater through runoff, altering or damaging the environment by overfertilizing aquatic vegetation, There appears to be three major horse-related land uses subject to erosion: horse lots, bridle trails, and grazing pastures. At some public and semipublic stables there is erosion or the potential for erosion in parking areas and on drives. Some erosion sites result in sedimentation in nearby ponds and watercourses. Still other sites were experiencing wind erosion from large outdoor rings. In general the response of the the owners of the horses to offers of education and assistance in maintaining their land has been positive. (Baker-FRC)
W83-03176

QUANTITATIVE MODELS AND ANALYSIS OF URBAN NONPOINT SOURCE WATER POLLUTION CONTROL SYSTEMS,
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
For primary bibliographic entry see Field 6A.
W83-03184

GROUNDWATER PURIFICATION BY INFILTRATION OF OZONIZED WATER (GRUNDWASSERSANIERUNG DURCH INFILTRATION VON OZONTEM WASSER),
Karlsruhe Univ. (Germany, F.R.).
G. Nagel, W. Kuhn, P. Werner, and H. Sontheimer.
Gas- und Wasserfach: Wasser/Abwasser, Vol 123, No 8, p 399-407, August, 1982. 10 Fig, 3 Tab, 14 Ref. English Summary.

Descriptors: Contamination, Pollutants, *Chlorination, *Groundwater, *Groundwater management, Oil pollution, Ozone, Organic compounds, Wells, Treated water, Sanitation, Technology, Biodegradation, Degradation, Groundwater barriers, Groundwater pollution, *Infiltration, *Federal Republic of West Germany.

Since 1980, the city waterworks of Karlsruhe has been using a new treatment technology for the sanitation of oil-polluted groundwater in one of their groundwater works. This sanitation project has already shown success. Water from the most polluted well is treated with ozone and infiltrated again through the contaminated ground. In the infiltration area a barricade against the polluted groundwater is built. Analytical data show no contamination of the groundwater following this process; tests to determine oxygen, organic carbon, and cyanide concentrations were conducted. The ozone process has the further advantage of reducing bacterial pollution. No chlorination or further treatment of this groundwater is required before public distribution. (Titus-FRC)
W83-03200

ASSESSING ENVIROMENTAL IMPACTS OF OPEN WATER DISPOSAL OF DREDGED SEDIMENT,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 6G.
W83-03251

COMPUTER SIMULATION OF LOCAL DESTRATIFICATION IN RESERVOIRS,
Oklahoma State Univ., Stillwater. Dept. of Mechanical and Aerospace Engineering.
D. G. Lilley, and A. A. Busnaina.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-219931, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Institute Completion Report, Oklahoma State Univ., Stillwater, May 1983. 58 p, 29 Fig, 1 Tab, 23 Ref. OWRT A-098-OKLA(1), 14-34-0001-1138.

Descriptors: *Computer models, Computer programs, *Stratification, Hydraulic models, *Reservoir releases, Reservoir construction, *Reservoir design, Mathematical analysis, *Mixing, Model studies, Water quality, *Jets, Stratified flows, Hydraulics, Lakes, Lake restoration, Reservoirs, Mathematical models, Hydrodynamics, Water quality control, Water quality standards, Water storage, *Destratification.

Stratification of lakes and reservoirs is a very common and typically undesirable problem during the hot summer months when the hypolimnion (bottom layer of water) becomes severely anerobic (oxygen deficient). This is harmful to biological life not only in lakes and reservoirs, but also in downstream river flow from the low-level release structure associated with the large mass of water. The Garton Pump consists of a low-energy axial flow propeller placed just below the surface so as to provide a downward directed jet of fluid and thereby locally mix reservoirs near the release structure of the dam. In this way high-quality epilimnion water is transported downwards, so obtaining local destratification and improved release water quality in the vicinity of low-level release structures. A comprehensive numerical simulation has been developed which is directly applicable to the practical situation. It complements associated experimental and empirical modeling programs. The flowfield is fully three-dimensional and a simplified numerical simulation and solution procedure has been formulated in Cartesian coordinates to include species diffusion and buoyancy forces. Both laminar and turbulent flow situations can be handled. Comparison of predictions with experimental data confirms that the main dynamic effects are modeled adequately and better than a previous two-dimensional simulation. This fundamental study with practical applications represents a low cost basic tool to show the influence of design parameters on the practical flowfield.
W83-03279

ARTIFICIAL DESTRATIFICATION TO PREVENT WINTERKILL,
Iowa State Univ., Ames. Dept. of Animal Ecology.
R. C. Summerfelt, and T. K. Cross.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220368, Price codes: A06 in paper copy, A01 in microfiche. Iowa State Water Resources Research Institute Completion Report No 113, Ames, March 1983. 93 p, 29 Fig, 15 Tab, 36 Ref, 2 Append. OWRT A-076-IA(1), 14-34-0001-0117.

Descriptors: Water quality, Lakes, *Aeration, *Destratification, Biochemical oxygen demand, Dissolved oxygen, Chlorophyll, *Winterkill, Oxygen depletion, *Lake restoration, Pumping, *Iowa, McFarland Lake, Horticulture Lake.

Although nearly all prior efforts to prevent winterkill of the fish populations of lakes by means of artificial aeration have been done during the ice-covered interval, the present study was undertaken to evaluate the hypothesis that artificial destratification by mechanical mixing during the summertime would reduce biochemical oxygen demand (BOD) at the onset of the ice-covered interval sufficiently to prevent wintertime anoxia and a fish kill. A low energy, axial-flow pump was used. Summertime pumping artificially destratified the experimental lake within 24 hours and, and with few exceptions, maintained at least 2 mg/l dissolved oxygen in the overlying, near-bottom stratum throughout the summer months. Both the oxygen and temperature of the near-bottom stratum was significantly higher during the summer's pumping than either before or after. As measured by concentration of chlorophyll a and Secchi disk transparency, algal blooms were moderated by pumping. Over the four years of aeration, there was an exponential decline in the volume weighted mean lake concentration of BOD that was present at the commencement of ice-cover in relation to the average percentage of the lake volume pumped during the summer period. Winterkill did not occur during the winters following summer pumping, whereas severe winterkill occurred the winter before pumping commenced and the winter following the post-pumping summer when pumping was not done.
W83-03299

EFFECTS OF SILVICULTURAL PRACTICES ON WATER QUALITY IN NORTHERN WISCONSIN,
Wisconsin Univ.-Stevens Point. Coll. of Natural Resources.
N. E. Spangenberg, and R. McLennan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220517. Water Resources Center Technical Report WIS WRD 83-07, Univ., of Wisconsin, Madison, 1983. 17 p, 3 Fig, 2 Tab, 15 Ref. OWRT A-095-WIS(1), 14-34-0001-2153.

Descriptors: *Cutting management, *Forest management, *Forest watersheds, *Soil erosion, *Water quality, Clear-cutting, Forest soils, Forestry, Mixed forests, Streams, *Wisconsin, Chequamegon National Forest.

Two areas in the Chequamegon National Forest were selected for studies of water quality and overland soil movement. One area, bordered on the North by the Marengo River, is a clearcut in a mixed hardwood stand with two small streams running through it. The second area is mixed hardwoods being logged with a selection cut. A stream runs through the active cutting area. Sample transects were established in the streams running through and bordering the timber harvest areas. Samples were collected at 2-week intervals and analyzed. Amounts of soil exposure and vegetative ground cover were estimated at random points along transects established in harvested and unharvested areas. Soil/vegetation data were collected at 2-week intervals. During the first growing season after clearcutting, there were few significant changes in water quality that could be attributed to the timber harvest. Soil disturbances caused by rubber tire skidders were virtually healed. Logging debris and vegetation produced almost 100% groundcover early in the growing season. This provided a high degree of soil protection, which minimized soil erosion during the first growing season. Selection cut harvesting with rubber tire skidding had no impact on water quality in the first growing season after the harvest. Harvesting exposed a minimum of soil and the amount of vegetative cover did not change. It is doubtful that selection cutting increased soil erosion on the site during the first growing season.
W83-03304

WATER QUALITY OF THE UPPER SPOKANE RIVER AND EVALUATION OF METHODS FOR MEASUREMENT OF THE EFFECT OF EFFLUENT UPON PRIMARY AND SECONDARY PRODUCERS,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W83-03317

FLOOD CONTROL EFFECTIVENESS OF SYSTEMS OF DUAL PURPOSE DETENTION BASINS,
New Jersey Dept. of Environmental Protection, Trenton.
For primary bibliographic entry see Field 4A.
W83-03350

COMPARISON OF RESERVOIRS WITH DISSIMILAR SELECTIVE WITHDRAWAL CAPABILITIES: EFFECTS ON RESERVOIR LIMNOLOGY AND RELEASE WATER QUALITY,
Army Engineer District, Portland, OR.
D. W. Larson.
Canadian Water Resources Journal, Vol 7, No 2, p 90-111, 1982. 4 Fig, 2 Tab, 16 Ref.

Descriptors: *Reservoirs, Construction, *Environmental effects, Fish, Wildlife, Recreation, Financial aspects, Water quality, Turbidity, Conduits, *Oregon, Lost Creek Reservoir, Hills Creek Reservoir, Planning, Decision making.

The effects of outlet structures and operational modes on reservoir limnology and on the quality of water released downstream were investigated. The subjects of the study were two reservoirs, Hills Creek in the Willamette River Basin and Lost Creek on the Rogue River, which are similar morphometrically but which have strikingly different water withdrawal capabilities. At Lost Creek Reservoir, selective withdrawal capability was increased immensely by the addition of a turbidity conduit, facetiously called an elephant truck, for rapid, downstream disposal of turbid inflows whenever river turbidity throughout the Rogue Basin was naturally high because of frequent winter storms and high streamflow conditions. The decision to add the conduit came late in the Project's development, actually near the end and after considerable debate. The cost of the conduit was about $150 million. In view of the fact that the Rogue River is one of the few remaining wild and scenic rivers in the contiguous US and because it is recognized internationally for its anadromous fish runs and unusually high water quality, the monetary cost of measures aimed at providing adequate protection for this valuable resource was considered justified. (Baker-FRC)
W83-03422

MULTIPURPOSE USE OF AN EUTROPHIC SOUTH AFRICAN MAN-MADE RESERVOIR,
Hydrological Research Inst., Pretoria (South Africa).
For primary bibliographic entry see Field 6D.
W83-03425

NUTRIENT CONTENTS AND ALGAL GROWTH IN AN IMPOUNDED RIVER: EFFECTS ON OXYGEN BALANCE AND NEED FOR NUTRIENT RETENTION (NAHRSTOFFGEHALTE UND ALGENWACHSTUM IN EINEM GESTAUTEN FLUSS, AUSWIRKUNGEN AUF DIE SAUERSTOFFBILANZ UND NOTWENDIGKEIT DES NAHRSTOFFRUCKHALTES),
For primary bibliographic entry see Field 5C.
W83-03454

CONTROL OF ALGAL DOMINANCE THROUGH CHANGES IN ZOOPLANKTON GRAZING, LAKE WASHINGTON: PHASE I,
Washington Univ., Seattle. Office of Public Archaeology.
H. J. Hartmann.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-226878, Price codes: A05 in paper copy, A01 in microfiche. Water Research Center Completion Report, Washington State Univ., Pullman, May 1983. 76 p, 16 Fig, 14 Tab, 46 Ref. OWRT B-089-WASH(1), 14-34-0001-1277.

Descriptors: Zooplankton, Phytoplankton, *Dominant organisms, *Algal control, Selectivity, *Nutrient requirements, Phosphorus, *Feeding rates, Phosphorus radioisotopes, Annual succession, Biomass, Epilimnion, Cycling nutrients, Diatoms, Chlorophyta, Cyanophyta, Cultures, Daphnia, Copepods, Water quality control, Fish management, *Washington, Lake Washington, *Selective feeding, *Phosphorus recycling, Daphnia pulicaria, Diaptomus ashlandi, Stephanodiscus hantzschii, Ankistrodesmus sp., Oscillatoria limnetica, Lake Washington, Lake management.

Mechanisms by which selective grazing and phosphorus recycling regulate phytoplankton abundance and succession were investigated. Food preferences of a cladoceran (Daphina) and a copepod (Diaptomus) on paired mixtures of a centric diatom (Stephanodiscus), a green (Ankistrodesmus) and a filamentous blue-green alga (Oscillatoria) were compared in double-isotope (P32/P33) feeding studies; phosphorus-limited growth and nutrient uptake of the algae were compared in batch-culture experiments. Zooplankton food selectivity and algal phosphorus uptake were size- and species-specific: Single-cell ingestion rates of small Daphina and adult copepods were similar, while large Daphnia ingested 1.6 times more cells/weight than Diaptomus. Daphina selected diatoms over green algae over a wide cell-concentration range (50 to 50,000 cells/ml). Selectivity was more significant in small than in large Daphnia. Diaptomus and large Daphnia rejected blue-green filaments against single cells, while small Daphnia could not reject filaments. Ankistrodesmus removed phosphate faster from the environment, grew faster and depleted internal phosphorus quicker than Stephanodiscus or Oscillatoria. Zooplankton changes in Lake Washington would be expected to influence dominance of centric diatoms, green, and similar single-celled algae, but are unlikely to affect abundance of filamentous blue-green algae.
W83-03467

AUTOMATION IN WASTEWATER TECHNOLOGY AND WATER QUALITY. PRACTICAL EXPERIENCE WITH CONTROL, REGULATION, AND AUTOMATION IN SEWER SYSTEMS, WASTEWATER TREATMENT, AND WATER QUALITY CONTROL (AUTOMATION IN DER ABWASSERTECHNIK UND GEWASSERGUTE. PRAKTISCHE ERFAHRUNGEN BEI DER STEUERUNG, REGELUNG UND AUTOMATION BEI DER ABWASSERABLEITUNG, ABWASSERBEHANDLUNG UND GEWASSERGUTEUBERWACHUNG,
Technische Univ., Munich (Germany, F.R.). Lehrstuhl und Pruefamt fuer Wassergutewirtschaft und Gesundheitsingenieurwesen.
For primary bibliographic entry see Field 5D.
W83-03469

SURFACE WATER QUALITY IN THE BORDER AREA BETWEEN EL PASO AND THE GULF OF MEXICO,
Texas Univ. at Austin. Dept. of Environmental Engineering.
G. A. Rohlich.
Natural Resources Journal, Vol 22, No 4, p 915-923, October, 1982. 2 Tab, 11 Ref.

Descriptors: *Water quality, *Water managemet, *Rio Grande, *Texas, *Mexico, Resources management, Reservoirs, Urbanization, Population dynamics, Surface water, Water pollution, Land use, Water pollution sources, Irrigation practices, Water quality management.

The present and future water quality problems in the portion of the Rio Grande between El Paso and the Gulf of Mexico are discussed. Water quality is influenced by climate, geology, streamflow characteristics, diversions, impoundments, land use, irrigation practices, discharge of municipal and industrial effluents, and inflow from nonpoint sources. Water quality of the International Amistad Reservoir was excellent, and quality of tributaries was good. The Pecos River had the highest mineral content and the Rio Grande the highest organic content. Water quality of the Falcon Reservoir and below to the Brownsville area is also good. Future developments may adversely affect water quality, primarily because of increases in population and urbanization. Growing municipal and industrial demands will impose a severe burden on surface water resources. Costs and benefits of future developments must be analyzed. (Small-FRC)
W83-03500

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

QUANTITATIVE MODELS AND ANALYSIS OF URBAN NONPOINT SOURCE WATER POLLUTION CONTROL SYSTEMS,
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
A. O. Esogbue.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-214940, Price codes: A10 in paper copy, A01 in microfiche. Environmental Resources Center Report No ERC 04-83, Georgia Institute of Technology, Atlanta, April 1983. 217 p, 20 Fig, 30 Tab, 55 Ref, 3 Append. OWRT B-147-GA(1), 14-34-0001-0215.

Descriptors: *Algorithms, Best management practices, Evaluation, Fuzzy clustering algorithms, Fuzzy sets, Management, Multilevel hierarchical model, *Nonpoint source water pollution, Public participation, Statistical analysis, Cost effectiveness, *Water pollution control, Systems analysis, *Georgia, Atlanta.

Agencies designated to implement the Clean Water Act of Public Law PS 72-500, Section 208 often encounter difficulties associated with the management of systems consisting of complex interactions of soft and imprecisely stated phenomena. Two such major areas in this implementation process concern the use of the publics in water resources plan formulation and the use of the so called best management strategies in the control of nonpoint source water pollution. The quantitative analysis of these systems as well as the development of quantitatively based models for measuring their effectiveness is the subject of the inquiry whose results are reported here. The central thesis is that because of the presence of soft imprecise variables, any qualification efforts should invoke the tools of fuzzy set theory. To prove this point, the goals of State Planning Agencies particularly relative to Erosion and Sedimentation Control were reviewed and the problems inhibiting compliance highlighted. The essentially fuzzy variables and phrases were syphoned out and a plan to minimize the fuzziness developed. The use of the publics in water resources planning was next considered leading to the development of a working definition of their effectiveness. A fuzzy multi-level hierarchical model which provides a pessimistic as well as an optimistic measure of this effectiveness was then developed and validated using the Water Resources Advisory Group of the Atlanta Regional Commission as the leitmotif. Various fuzzy clustering algorithms were developed to group the field data. This model was also used to analyze the contributions of various hypothesized variables (factors) on the total system effectiveness of public participants and planners. A comprehensive list of BMPs in use in the State of Georgia as well as in the nation was developed and a statistical analysis of their effectiveness performed. Effectiveness was approached both from the system and cost effectiveness perspectives. The total effectiveness of BMPs as a control approach for nonpoint source pollution was assessed using a modification of the fuzzy multilevel model. As in the public participation effectiveness measurement, the contributions of each design principle to total system and cost effectiveness were determined. A statistical analysis of the importance and effectiveness of each BMP was also performed leading to a ranking of these BMPs, structural and nonstructural, in terms of their effectiveness.
W83-03184

MULTIPLE USE RESERVOIR PLANNING APPROACHES: LAC SEUL, NORTHWESTERN ONTARIO,
Hough, Stansbury and Michalski Ltd., Toronto (Ontario).
A. J. Usher, and M. F. P. Michalski.
Canadian Water Resources Journal, Vol 7, No 2, p 350-364, 1982. 1 Fig, 5 Ref.

Descriptors: *Water resources development, *Planning, *Public participation, *Management, Water management, Reservoirs, Financial aspects, Conjunctive use, Benefits, *Ontario, Lac Seul, *Multiple use reservoir planning.

Preparation of alternative resource management strategies for Lac Seul required a novel planning approach to deal with interdependence and competition among resource uses and users. Competition between regulation for power generation on the one hand and fisheries, recreation, amenities, and wild rice on the other was of particular concern. Four alternative strategies were developed which would allow government and public to consider the questions of broad policy objectives, and beneficiaries of resource development. Problems limiting the effectiveness and acceptability of the planning approach are reviewed, and planning and management directions applicable to multiple use reservoirs as well as to other multiple use land and water areas are suggested. The outcome of the studies suggests that planners and managers must become more committed to economic analysis, including marginal analysis, of the benefits and costs of various resource uses if they wish to more closely approach optimal management of reservoirs and other land and water areas. No one government agency can be responsible for all aspects of resource planning and management. There will always be controversy and conflict among resource user communities over competing objectives and uses. However, if resource management agencies commit themselves to laying all the cards on the table for public scrutiny, these controversies and conflicts are likely to be dealt with most straightforwardly and effectively. (Baker-FRC)
W83-03211

MATHEMATICAL MODEL FOR LONG-TERM WATER SUPPLY PLANNING (MATHEMATISCHES MODELL FUR DIE LANGFRISTIGE WASSERVERSORGUNGSPLANUNG),
Hanover Univ. (Germany, F.R.). Inst. fuer Wasserwirtschaft, Hydrologie und Landwirtschaftlichen Wasserbau.
H. A. Billib.
Wasserwirtschaft, Vol 71, No 1, p 16-18, January, 1981. 2 Fig, 1 Tab, 9 Ref. English Abstract.

Descriptors: *Planning, *Water supply, *Operating costs, *Systems analysis, *Mathematical models, Long-term planning, Costs, Optimization, Model studies, Investment, Economic aspects, Hanover, *Federal Republic of Germany.

Long term water supply planning involves problems of sequencing and scheduling of alternative or interconnected projects, optimizing the time of investment for a project set, and minimizing operational costs. To solve this complex capacity expansion problem a multilevel problem is conceived, which connects different methods of operations research. For the first level, the sequence of potential projects, the technique of heuristic approximation is applied. Then dynamic programming is used to determine the optimal investment schedule for a given new project. Finally, through linear programming the project with maximum capacity is identified. An example of this technique applied to a plant near Hanover is presented. Further research is proposed in which additional dimensions of the problem are incorporated and sensitivity analysis is performed on the results. (Titus-FRC)
W83-03224

ESTIMATION OF THE ECONOMIC WORTH OF WATER FOR RELEASE DECISIONS,
Oklahoma State Univ., Stillwater. Dept. of Management.
R. Sharda.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-219949. Water Resources Research Institute Completion Report, Oklahoma State Univ., Stillwater, April 1983. 90 p, 28 Fig, 8 Tab, 36 Ref. OWRT A-104-OKLA(1), 14-34-0001-1138.

Descriptors: *Cost benefit analysis, *Travel time, *Navigation, *Benefits, *Multiobjective planning, *Recreation, *Recreation demand, *Reservoir releases, *Time series analysis, Flow control, Flow discharge, Optimization, Multipurpose reservoir, Multireservoir networks, Reservoir operation, *Oklahoma, Arkansas River.

Optimization of a multipurpose reservoir system operation can be accomplished through mathematical programming only if the benefits and costs of the operation are known. A number of mathematical programming applications use the hydropower generation as the objective (as it is easily quantifiable) and incorporate the other purposes through constraints. This study attempted to relate release decision variables to recreation benefits and navigation costs on the McClellan-Kerr Arkansas River Navigation System. These relationships can then be used in a mathematical programming model for release decisions. This report describes one of the few applications of the Box-Jenkins multiple time series methodology to recreation and water level data. The results indicate that the water level of the area lakes has a significant positive relationship with visitor days. Real income in Oklahoma was also found to be an important variable in explaining the variation in visitor-days. This presents questions such as whether the reservoirs system should be operated to maximize income producing purposes like navigation and hydropower generation, or to consider recreation benefits explicitly in the operation planning. In modeling navigation benefits, a weak evidence exists that flow reduces travel time for boats linearly on downward trips but has a quadratic relationship with travel time on upward trips. Work is in progress to convert these relationships into dollar costs of flow regulation. Overall, the project developed a framework for a real life application of optimization models by first developing the appropriate costs/benefits.
W83-03280

INDEX CONSTRUCTION FOR MULTIPLE OBJECTIVE ANALYSIS OF LAND AND WATER USE IN A HIGH MOUNTAIN WATERSHED,
Utah Water Research Lab., Logan.
L. D. James, D. T. Larson, M. McKee, J. J. Messer, and T. Twedt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220004, Price codes: A16 in paper copy, A01 in microfiche. Completion Report, May 1983. 252 p, 14 Fig, 41 Tab, 103 Ref. OWRT C-80129-P(No 8407), 14-34-0001-8407.

Descriptors: *Comprehensive planning, *Multiobjective planning, *Land use, Wilderness areas, Wildlife habitats, Recreation, Phosphate mining, *Indexing, Indicators, Attributes, Hunting, Fishing, Forest watersheds, Snowmelt, Natural streams, Water quality, *Watershed management, *Idaho, Upper Blackfoot watershed, Mountain watershed.

The objective of this study was to use the Upper Blackfoot watershed in the mountains of Southeastern Idaho as an arena for developing methods for construction, refinement, and application of indices needed to design land and water management schemes, compare alternatives, and influence the public in their uses of the area. A total of 21 uses were examined on 343 land units of a 160 square-mile area ranging in elevation from 6300 to 9000 feet and where the principal activities of grazing, lumbering, mining, and recreation can only be undertaken in the summer after the snow has melted. The indices considered were a reasonability index for screening out unreasonable uses at the start of the planning process, an index of use intensity for estimating an amount for reasonable uses, and an index for estimating the utility of the amount of use made from the public viewpoint. Data were collected on 43 attributes for the 343 land units and used in a linear programming model to maximize 1) economic benefits from use of the area, and 2) minimize environmental disturbance. The resolution in the available use data limited the model solution to allocating uses among 18 larger land units. The primary factor limiting the modeling, however, was the lack of information for defining the interactions among the uses. The analysis provides a framework for classifying and identifying interactions beginning with the simplest case of simultaneous use by two uses in near proximity.
W83-03286

REAL-TIME FORECASTING OF RIVER FLOWS AND STOCHASTIC OPTIMAL CONTROL OF MULTIRESERVOIR SYSTEMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 4A.
W83-03323

TOWARD AN ECONOMETRIC MODEL TO ANALYZE IMPACTS OF WATER AVAILABILITY ON THE OREGON ECONOMY,
Oregon State Univ., Corvallis. Dept. of Agricultural and Resource Economics.
G. W. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83 221796. Price codes: A10 in paper copy, A01 in microfiche. Water Resources Research Institute completion report, Oregon State University, Corvallis, May 1983. 204 p, 16 Tab, 79 Ref, 1 Append. OWRT A-055-ORE(1). 14-34-0001-1139.

Descriptors: *Econometrics, *Econometric models, *Regional models, Income, Prices, Employment, Agriculture, Simulation, *Oregon economy, Oregon gross product.

A macro-econometric model was developed relating the performance of Oregon agriculture, the state's most water-dependent industry, to the performance of Oregon's economy. Linkages between Oregon's agricultural sector, the national economy, and private non-farm sectors of the Oregon economy were emphasized, particularly the latter two elements. The model, with 102 equations, has separate blocks for gross product, average wages and prices, employment, and income. Simulation techniques were used to validate the model and test the performance. The model provides a macroeconometric explanation of the performance of annual levels of output, prices, employment, and income over two decades (1960-1979). Forecasts from this model can be produced utilizing forecasts from national macromodels. Regional econometric models have potential for analyzing impacts of water-related changes on Oregon's agriculture and economy. This research contributes to that eventual accomplishment by developing an econometric model of Oregon's economy. The possible directions for improving and/or extrending this model are also indicated. Various methods for constructing regional models are reviewed with emphasis on tradeoffs between application of economic theory and availability of data. Procedures used and problems encountered in estimating equations of regional econometric models are discussed, as are methods for validating and simulating these models.
W83-03326

THE FLOOD MITIGATION POTENTIAL OF INLAND WETLANDS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
H. Ogawa, and J. W. Male.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-223024, Price codes: A08 in paper copy, A01 in microfiche. Water Resources Research Center Publication No 138, Massachusetts University, Amherst, March 1983. 164 p, 25 Fig, 19 Tab, 80 Ref. OWRT A-136-MASS(1), 14-34-0001-1123.

Descriptors: *Flood control, *Wetlands, *Watershed protection, Watershed management, Flood recurrence interval, Runoff, Storage capacity, Streamflow, Model studies, Hydrologic models, Simulation, Computer models, *Massachusetts, Non-structural alternatives.

This study investigates evaluation methodologies for the flood mitigation function of inland wetlands, and is intended to provide a tool useful in regulatory decision-making. The simulation methodology employs several publicly available computer models and is applied to data obtained for three eastern Massachusetts watersheds. The models are simulated under three rainfall intensities (10, 100, and 500 year recurrence intervals with 24-hour duration) and three antecedent moisture conditions (dry, moderate, and wet). The wetland encroachment conditions include five levels: 0, 25, 50, 75, and 100%. Because detailed simulation studies are often too time-consuming for wetland regulatory decisions, the simulation results for this study's watersheds are generalized. Analyses show that the effectiveness of a wetland in reducing downstream flooding increases with increases in (1) the area of the wetland, (2) its location downstream, (3) the magnitude of flooding, and (4) the degree of encroachment on the wetland. The wetland's effectiveness decreases with increases in (1) the distance downstream from that wetland and (2) the number and size of other storage areas upstream of damage locations. Regression analyses provided a quick and quantitative assessment of the impacts of wetland encroachment on downstream flooding. However, these results should be used with caution since they are based on regional simulations.
W83-03349

CITIZEN PARTICIPATION IN THE DESIGN AND MANAGEMENT OF RESERVOIRS,
Connor Development Services Ltd., Oakville (Ontario).
D. M. Connor.
Canadian Water Resources Journal, Vol 7, No 2, p 223-237, 1982. 1 Fig, 12 Ref.

Descriptors: *Reservoirs, *Management, *Public participation, Design criteria, Decision making, Planning, Water resources development, Water supply, *Citizen participation, *Canada.

A model of constructive citizen participation is presented along with a set of assumptions, a definition and a process flow chart. To implement the model, several effective operational techniques are outlined: the Social Profile, the Open House, the Citizen Advisory Committee and the use of responsive publications. Cross-cultural applications are also indicated. Since, in many cases, problems with the public are symptoms of internal organizational problems, ten important management considerations are reviewed. These ten include organizational needs determinations, policy review, internal communications, delegation, budgeting, manpower planning, management style, evaluation, program design, and organizational social profile. A strategy for corrective measures is described, including information on profiling, projecting, assessing, and

managing. A case study of hydroelectric development is provided. (Baker-FRC)
W83-03418

MULTI-PURPOSE STORAGE SYSTEMS: OBJECTIVE, CONFLICTS, ALTERNATIVES,
Stanford Univ., CA. Dept. of Operations Research.
N. Buras.
Canadian Water Resources Journal, Vol 7, No 2, p 208-222, 2 Fig, 10 Ref.

Descriptors: *Water storage, *Decision making, *Planning, Reservoirs, Management, Model studies, Multipurpose reservoirs, Water resources development, Mathematical studies, Alternative planning.

Water resources systems are planned to attain a number of objectives or goals, some of which may conflict with one another. The multi-objective approach offers procedures for the generation of non-inferior alternatives and for structured interactions between decision-making and modeling. It was demostrated that mathematical models and operations research techniques are effective instruments for the analysis of objectives and conflicts and for the evaluation of alternative policies relevant to the design, operation and management of multipurpose storage systems. Examples of models relevant to multipurpose water resources systems are reviewed; they enable a clearer representation to be made of the complexities of these systems. A growing body of research is now oriented towards solving multi-objective decision issues, seeking possible trade-offs between conflicting objectives. Three groups of models appear to be particularly appropriate for analyzing the possible effects of multipurpose systems. These are screening models, simulation and sequencing models. The classification is somewhat arbitrary, since design and operation are so closely interactive. (Baker-FRC)
W83-03424

AN ECONOMIC ANALYSIS OF OBSTACLES TO WATER CONSERVATION IN MONTANA WATER LAW,
Montana State Univ., Bozeman. Dept. of Agricultural Economics and Economics.
For primary bibliographic entry see Field 4B.
W83-03464

6B. Evaluation Process

AN ECONOMIC ANALYSIS OF THE DEVILS LAKE BASIN AND PROPOSED LAND USE,
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
J. A. Leitch, and D. F. Scott.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-219741, Price codes: A06 in paper copy, A01 in microfiche. North Dakota Water Resources Research Institute Completion Report, North Dakota State University, Fargo, January 1983. 123 p, 16 Fig, 52 Tab, 21 Ref. OWRT B-034-NDAK(3).

Descriptors: *Land use, *Flood damage, Wetland, Drainage, *Flooding, *Surveys, *Snowmelt, Runoff, Balance of Nature, Devils Lake Basin, *Hunting, Employment, Permits, *North Dakota, Social values, Attitudes.

Part I: Two farm operators surveys were conducted in the Devils Lake Basin of North Dakota to collect information on farmer attitudes and dollar losses associated with flooding of agricultural land. A preliminary survey was drawn to assess farm operator attitudes toward wetland, drainage, and flooding; and to identify problem areas relative to collecting information on dollar losses due to flooding. The annual average total dollar loss due to flooding in the entire Basin was estimated to be $1.9 million using long-run price relationships, and $2.9 million using 1974 price relationships. Part II: The type of flooding discussed is a result of spring snowmelt or summer rainfall on relatively flat land with poor natural drainage. This 'sheetwater flooding,' is a problem in the Devils Lake Basin that causes damages to agricultural production. Any plan to reduce flood damages may adversely affect the ecological balance of the region. A planning process was initiated in 1975 to arrive at a solution and public participation has been an important element. Part III: A survey for nonresidents who hunted in North Dakota in 1976 was conducted to obtain information on their expenditures in the state for three main reasons: (1) they had hunted here before, (2) they had friends or relatives in the state, and (3) they were former residents. The estimated total expenditure (excluding license) by all nonresident hunters in 1976 was $2.5 million which resulted in a total of $6.3 million in gross business volume and resulted in direct or nondirect employment of 178 people.
W83-03270

ESTIMATION OF THE ECONOMIC WORTH OF WATER FOR RELEASE DECISIONS,
Oklahoma State Univ., Stillwater. Dept. of Management.
For primary bibliographic entry see Field 6A.
W83-03280

WORTH OF INFLOW FORECAST FOR RESERVOIR OPERATION,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 4A.
W83-03296

ECONOMIC IMPACTS OF TRANSFERRING WATER FROM AGRICULTURE TO ALTERNATIVE USES IN COLORADO,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 6D.
W83-03303

THE COSTS AND BENEFITS OF SOIL EROSION CONTROL IN THE NORTH LAKE CHICOT WATERSHED,
Arkansas Univ., Fayetteville. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 4D.
W83-03331

USE OF HEDONIC PRICE TECHNIQUE TO EVALUATE WETLANDS,
Massachusetts Univ., Amherst. Dept. of Agricultural and Resource Economics.
P. G. Allen, and T. H. Stevens.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222414, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Center Publication No 136, Massachusetts University, Amherst, March 1983. 42 p, 2 Fig, 19 Tab, 19 Ref, 1 Append. OWRT A-134-MASS(1), 14-34-0001-1123.

Descriptors: *Wetlands, *Property values, Real property, Cost-benefit analysis, *Economic rent, *Land appraisals, Regional economics, Tangible benefits, Social values, *Prices, *Massachusetts, *Hedonic price technique, Shoreline value.

The property value technique was used to estimate the economic value of wetlands and open space between residential areas and shorelines for nine areas in Western Massachusetts. In an attempt to control for different neighborhood effects (e.g., distances to schools, central business district, major highway interchanges, and other socioeconomic factors) relatively small and homogeneous tracts were sampled. Analysis using principal components regression showed highly variable results in terms of the location rent due to wetland and wetland adjacent open space. Attempts were made to explain the variability of results by (1) investigation of the sensitivity of the results to function specification, particularly component deletion, (2) analysis of socioeconomic and gross locational differences, and (3) subjective measurement of site attributes based on amenity and visual scoring methods. The principal conclusion was that results are extremely sensitive to model specification. The authors conclude that the property value technique, by itself, may be inappropriate for valuation of nonunique wetland resources.
W83-03343

EXPANSION POTENTIAL FOR IRRIGATION WITHIN THE MISSISSIPPI DELTA REGION,
Arkansas Univ., Fayetteville. Dept. of Agricultural Economics and Rural Sociology.
R. N. Shulstad, R. D. May, J. M. Erstine, B. N. Phillips, and B. E. Herrington, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222430, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Center Publication No 93, Univ. of Arkansas, Fayetteville, March 1983, 55 p, 7 Tab, 2 Fig, 8 Ref, 1 Append. OWRT A-054-ARK(1), 14-34-0001-2104.

Descriptors: *Irrigation, Irrigation wells, *Economic feasibility, *Cost-benefit analysis, Sprinkler-irrigation, Flood irrigation, Furrow irrigation, Land forming, *Arkansas, *Mississippi Delta Region.

17.6 million acres, or 73%, of the Mississippi Delta Region is currently cropland and possesses the physical characteristics of slope, texture and soil type which are recommended for irrigation. Economic feasibility of expanding irrigation by flood, furrow and center pivot methods were examined under 24 scenarios representing two sets of crop prices, yield levels, production costs, opportunity costs and six crop rotations. Irrigation was economically feasible for 56 to 100% of the cropland across all scenarios. Approximately 88% of the cropland can be economically irrigated with flood and furrow in its present form, 8% yield highest net returns if furrow irrigated following land forming and 4% can be economically irrigated only with center pivot systems.
W83-03345

COMPARISON OF RESERVOIRS WITH DISSIMILAR SELECTIVE WITHDRAWAL CAPABILITIES: EFFECTS ON RESERVOIR LIMNOLOGY AND RELEASE WATER QUALITY,
Army Engineer District, Portland, OR.
For primary bibliographic entry see Field 5G.
W83-03422

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

PARAMETRIC STUDY OF SEAWATER REVERSE OSMOSIS DESALTING PLANTS,
Bechtel Group, Inc., San Francisco, CA.
For primary bibliographic entry see Field 3A.
W83-03316

COST AND PRECISION IN A STREAM SAMPLING PROGRAM,
Montana Univ., Missoula. Dept. of Zoology.
A. L. Sheldon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222257, Price codes: A02 in paper copy, A01 in microfiche. Montana Water Resources Research Report No 129, Montana State Univ., Bozeman, May 1983. 16 p, 3 Fig, 1 Tab, 7 Ref. OWRT A-128-MONT(1), 14-34-0001-1128.

Descriptors: *Sampling, *Cost-benefit analysis, Project planning, Benthos, *Fixed costs, *Variable costs, Precision, *Nomograms, Research planning, Lolo Creek, Missoula, *Montana.

Nomograms relating fixed, variable and total costs (time) to sample size and precision are presented for use in research planning. Time costs for a survey of a Montana, USA, stream were dominated by fixed costs and the laboratory component of variable costs while variable field costs were small. Reductions in both fixed and variable costs influence precision of low-budget survey sampling while reduction of variable costs in large-budget research sampling has more effect on total cost than on precision.
W83-03336

TOPICAL QUESTIONS ON CENTRAL CONTROL AND MONITORING FOR WATER SUPPLIES (AKTUELLE FRAGEN BEI ZENTRALER STEUERUNG UND UBERWACHUNG VON WASSERVERSORGUNGEN),
Ingenieurburo Grombach G.m.b.H., Bad Homburg (Germany, F.R.).
For primary bibliographic entry see Field 5F.
W83-03449

6D. Water Demand

A TEST FOR INEQUITY IN RIVER RECREATION RESERVATION SYSTEMS,
North Central Forest Experiment Station, St. Paul, MN.
J. H. Schomaker, and E. C Leatherberry.
Journal of Soil and Water Conservation, Vol 38, No 1, p 52-56, January-February, 1983. 1 Fig, 4 Tab, 5 Ref.

Descriptors: *Recreation demand, *Rivers, Public policy, Reservation, Water management, Water use, Water demand.

The question of whether reservation systems discriminate against certain segments of the population has been addressed. The study draws on data collected from floaters on 26 river stretches not currently subject to reservation systems to determine whether an identifiable group would be placed at a disadvantage if these systems were subject to reservation. The rivers studied vary widely in location and characteristics. Included were remote, western whitewater rivers as well as placid rivers near large population centers in the Northeast. For the rivers studied and the characteristics measured it was concluded that reservation systems for river recreation will not unduly discriminate against an identifiable group. If this fear does exist, however, managers can implement a reservation system that permits some spontaneous trips. On a river where use must be limited, a reservation system seems to be a reasonably fair technique that will be quite readily accepted by the public. A shift in use might occur after implementation of a reservation system, and for this reason a careful study of user characteristics should be made before implementation of such a system and again after it has been implemented. The questionaire developed for the National River Recreation Study is recommended as the tool to be used in monitoring the effect of a reservation system. (Baker-FRC)
W83-03175

EFFICIENT USE OF WATER FOR IRRIGATION IN THE UPPER MIDWEST,
Illinois Univ. at Urbana-Champaign. Water Resources Center.
G. E. Stout, P. N. Walker, W. D. Goetsch, M. D. Thorne, and E. C. Benham.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-219964, Price codes: A04 in paper copy, A01 in microfiche. Research Report No 176, April 1983. 60 p, 5 Fig, 8 Tab, 10 Ref. OWRT B-120-ILL(6), 14-34-0001-9113.

Descriptors: Alfalfa, Corn, Soybeans, *Irrigation, Water resources, Groundwater, Surface water, *Soil moisture, *Soil moisture models, *Claypan soils, *Drainage, *Economic models, *Water use, North Central U. S., Water demand, Crop yields, Crop response.

The objectives of this multidisciplinary interinstitutional regional study were (1) to determine parameters needed for existing or improved models of crop response; (2) to relate yield response to costs and revenues by assessing the water demand for irrigation; and (3) to study the demand for irrigation, present and projected, and its availability as related to public allocation decisions. From this series of studies it was concluded that: (1) There are many areas of the Midwest with sufficient groundwater and surface water resources to support the development of irrigation. (2) Soil moisture models indicate that only moderate yield response to irrigation can be expected on high moisture soils; on lighter soils and claypan soils, yield response is significant, even in regions with relatively high precipitation. (3) Irrigation and drainage on claypan soils can dramatically increase corn yields. (4) It appears economically worthwhile for the individual farmer operating on moderate soils or on claypan soils to evaluate capital investments in irrigation along with other capital investments. (5) Increases in yields and persistence of alfalfa due to irrigation appear to be insignificant when compared to conventional management practices; further research is needed. A potential, however, appears to exist for improving adaptation of alfalfa varieties to soil water deficits.
W83-03282

IRRIGATION WATER RESPONSE FUNCTION ESTIMATION: AN IMPROVED RIDGE REGRESSION METHODOLOGY,
Montana State Univ., Bozeman. Dept. of Agricultural Economics and Economics.
M. D. Frank, B. R. Beattie, and O. R. Burt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220392, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Center Completion Report, Montana State Univ., Bozeman, April 1983. 26 p, 3 Fig, 1 Tab, 24 Ref. OWRT B-053-MONT(1), 14-34-0001-0270.

Descriptors: *Water demand, *Production function, *Economic value, *Ridge regression method, Texas, California, *Agricultural use, Southern Texas High Plains, Central California Valley, *Irrigation water.

The long-run viability of irrigated agriculture in many important agricultural regions of the western United States is of major concern. Reliable estimates of water's agricultural use value is fundamental if issues involved in water use efficiency and allocation are to be resolved. This report represents an improved methodology for estimating parameters of agricultural water response models (production functions) from which irrigation water values may be derived. The proposed approach is stochastic-prior-ridge regression with an exact restriction imposed on the sum of the factor elasticities (scale parameter). The procedure is applied with good results to cross-sectional data for the Southern High Plains of Texas and the Central Valley of California.
W83-03302

ECONOMIC IMPACTS OF TRANSFERRING WATER FROM AGRICULTURE TO ALTERNATIVE USES IN COLORADO,
Colorado State Univ., Fort Collins. Dept. of Economics.
R. A. Young.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220400, Price codes: A04 in paper copy, A01 in microfiche. Colorado Water Resources Research Institute Completion Report No 122, Colorado State University, Fort Collins, April 1983. 55 p, 2 Fig, 2 Tab, 30 Ref. OWRT A-048-COLO(1), 14-34-0001-1106.

Descriptors: *Economic impact, *Water use, *Water costs, *Water demand, Management, *Colorado, Water supply, Water allocation, *Alternative use, Urban water use.

This study is premised on the emergence of two sets of forces which reflect the economics of water allocation in Colorado. The first is the increasingly rapid growth of demands for water in non-agricultural uses. The second premise is that Colorado is passing from the 'expansionary' phase to the 'mature' phase. In the former phase the incremental cost of water remains constant over time, so that new supplies are readily obtainable at reasonable cost. The mature phase, brought on by growth and change in the economy, is characterized by rapidly rising incremental costs and greatly increased interdependencies among water uses and users. In a maturing water economy the high cost of new water brings about a search for water supplies from agricultural uses whose economic value productivity is less than the cost of new water supplies. The study assesses the economic impacts of transferring water from agriculture to urban uses in Colorado.
W83-03303

THE IMPACT OF INSTITUTIONAL STRUCTURE AND CITIZEN PARTICIPATION ON WATER RESOURCE PLANNING IN WESTERN KANSAS,
Kansas Water Resources Research Inst., Manhattan.
J. W. Converse, and T. R. Harris.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222190, Price codes: A04 in paper copy, A01 in microfiche. Contribution No 233, September 1982. 54 p, 1 Fig, 6 Tab, 28 Ref. OWRT B-070-KAN(1), 14-34-0001-1228.

Descriptors: *Citizen participation, Groundwater depletion, Groundwater management district, Water conservation, Farm consolidation, Migration, *Community infrastructure, *Institutional support structure, Agriculture, *Kansas, Ogallala aquifer, *Irrigation, *Crop decisions, Corn, Energy costs, Farm size, Fertilizers, Equipment costs.

The impacts of institutional structure and citizen participation on water resource planning in western Kansas were studied by analysis of census data; by interviews with farmers focusing on their decisions and reasons for decisions; by interviews with others including input suppliers and government agency personnel; and by observation of groundwater management district (GWMD) meetings. Analysis of secondary data suggested that expansion of irrigated acreage may stem or delay outmigration and farm consolidation. Farmers typically viewed water as only one of several important inputs. Cost of pumping rather than actual scarcity was usually the main reason for farm-level efforts to conserve water. Most operations reduced corn acreage between 1978 and 1982, often shifting to irrigated crops requiring less water. The very largest operations were more likely than others to increase corn acreage. GWMDs had a relatively high level of public support. They actively carried out their policies limiting water use as well as promoting voluntary conservation, and they may become increasingly involved in water quality protection in the future. Some difficulty resulted from division of enforcement between the GWMDs and the state Division of Water Resources. Some ambiguities in the relation between irrigated agriculture and the vitality of community infrastructure are discussed.
W83-03330

USE OF WATER IN ARKANSAS, 1980,
Arkansas Geological Commission, Little Rock.
T. W. Holland, and A. H. Ludwig.
Arkansas Geological Commission Water Resources Summary 14, 1981. 30 p, 4 Fig, 10 Tab, 14 Ref.

Descriptors: *Water use, *Groundwater, *Surface water, *Water demand, Aquifers, Reservoirs, Consumptive use, Irrigation, Electric power production, Fish farming, Municipal water, Domestic water, Industrial water, Thermal powerplants, Water supply, Arkansas.

This report summarizes the results of the 1980 Arkansas water-use inventory. Water-use data for the following catagories is public supply, 263 million gallons per day; self-supplied industry, 235 million gallons per day; rural domestic and livestock, 118 million gallons per day; irrigation, 4,082 million gallons per day; fish and minnow farms, 415 million gallons per day; wildlife impoundments, 139 million gallons per day; and electric-energy generation 35,461 million gallons per day. These data are tabulated by county, by hydrologic unit, and by source. Water withdrawals during 1980 were 40,714 million gallons per day, of which ground water provided 4,056 million gallons per day, and surface-water sources supplied 36,658 million gallons per day. The largest use of water was for electric-energy generation, which accounted for 87% of the total withdrawals. Excluding hydroelectric diversions, 1980 surface-water use was

1,200 million gallons per day, and 1980 groundwater use was 4,053 million gallons per day. Nine % (3,599 million gallons per day) of the total was consumed. (USGS)
W83-03367

A PUBLIC PARTICIPATION DECISION TO FILL A PACIFIC NORTHWEST RESERVOIR,
Army Engineer District, Portland, OR.
R. A. Cassidy, and E. B. Johnson.
Canadian Water Resources Journal, Vol 7, No 2, p 305-314, 1982. 2 Fig, 4 Ref.

Descriptors: *Reservoir, *Public participation, Planning, *Decision making, Water management, Water resources development, Social participation, Construction, Dam construction, Dams, Water supply, *Oregon, Lost Creek Dam.

The United States Army Corps of Engineers constructed a 105 meter long multipurpose dam, Lost Creek Dam, in the Rogue River Basin, Oregon. Construction was completed during a drought in mid-October 1976, but the decision to begin filling was delayed until late January 1977. Closure of the diversion tunnel to impound water during the drought was opposed by numerous federal, state and local officials because of the danger to the $20 million per year anadromous fishery of national acclaim downstream of the dam. Although the Corps withdrew its decision to close the tunnel and impound water, a local Chamber of Commerce requested that the social and economic effects be considered. Following three weeks of public participation, most of the people that originally opposed closure changed their position. The diversion tunnel was closed and the dam began impounding water on February 18, 1977. Earlier closure of the diversion tunnel to start filling the reservoir would have been more beneficial to the multiple water resources needs of the Rogue River. The public decision to close the project was based on a balanced evaluation of the multiple purpose needs of fisheries, irrigation, hydroelectric power and recreation in the Rogue River Basin. (Baker-FRC)
W83-03423

MULTIPURPOSE USE OF AN EUTROPHIC SOUTH AFRICAN MAN-MADE RESERVOIR,
Hydrological Research Inst., Pretoria (South Africa).
C. A. Bruwer.
Canadian Water Resources Journal, Vol 7, No 2, p 238-254, 1982. 1 Fig, 5 Tab, 14 Ref.

Descriptors: *Reservoirs, Water resources development, *Management, Decision making, Planning, Fisheries, Recreation, Water quality, Eutrophication, Nutrients, Stratification, Potable water, Water supply, *South Africa, Hartbeespoort Dam.

Hartbeespoort Dam lies in close proximity to two major population centers in South Africa. It was constructed in 1925 with the sole purpose of irrigation water supply. Through the years multipurpose use demands such as recreational, conservational, land use along the shores and flood control developed extensively. In order to put the multiple use demands on the reservoir into perspective it is important to follow the changes in water quality of the reservoir from the time of construction to recent times. Essentially the Dam may be described as an eutrophic, shallow, warm, stratified, monomictic lake with winter overturn occurring during May each year and summer stratification occurring from September to April. Main sources of nutrients to the reservoir are secondary treated sewage effluent from the city of Johannesburg and nitrogen-rich effluents from industries discharged into the Crocodile River. Current management procedures have been developed through the years in isolation by each agency which had a responsibility towards a certain aspect of the reservoir. Local government through a number of autonomous agencies controls fisheries and recreation on the reservoir, treats raw water to potable standards, and discharges secondary treated sewage and industrial effluents to the reservoir. All agencies are being called upon to define predetermined goals to be achieved by management. (Baker-FRC)
W83-03425

FACTORS INFLUENCING HOURLY AND DAILY WATER DEMAND (UBER DIE STUNDEN-UND TAGEWASSERBEDARF BEEINFLUSSENDEN FAKTOREN),
Wroclaw Technical Univ. (Poland). Inst. of Environmental Engineering.
Z. Siwon, and J. Ciezak.
Gas- und Wasserfach: Wasser/Abwasser, Vol 122, No 8, p 364-368, 1981. 3 Fig, 4 Tab, 9 Ref. English Abstract.

Descriptors: *Correlation analysis, *Regression analysis, *Water use, *Consumptive use, *Forecasting, Projections, Water management, Resources management, mathematical studies Statistical analysis, *Water demand.

The correlation between daily and hourly water consumption, as well as some factors affecting this correlation, were studied. A short-range forecasting of the daily and hourly water demand over a period of one to three days can be carried out using multiple regression equations which incorporate the following parameters: the weekly cycle of water consumption, meteoroligical factors, the quantity of water consumed the day before, and the quantity consumed two to three days before. The coefficients in the regression equations can be calculated from the quantities of water consumption observed a year before and in January of the year for which the forecast is being made. (Author's abstract)
W83-03438

TECHNOLOGY ASSESSMENT OF IRRIGATION SCHEDULING AND CROP RESPONSE,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3F.
W83-03488

WATER-ITS ROLE FROM NOW TO THE YEAR 2000,
Texas Univ. at Austin.
E. T. Smerdon.
Natural Resources Journal, Vol 22, No 4, p 907-914, October, 1982. 9 Ref.

Descriptors: *Water management, *Crop production, *Energy, *Mexico, *United States, Resources management, Water requirements, Water supply, Water quality.

Mexico-US transboundary resource needs and issues are discussed, with emphasis on the relationships between water and food and water and energy. Sufficient water is key to producing the food needed by mankind. While water is the key to productivity, it is also a limiting factor. Water will be needed in the US to develop and transport alternate energy sources. Adequate analysis has not been made of the impact of diverting water from agricultural uses to energy uses. The sociological and economic impacts of a shift in water use must be examined. Future water needs must be assessed carefully to ensure that future food and energy needs can be met. (Small-FRC)
W83-03491

WATER AVAILABILITY IN THE NEW MEXICO UPPER RIO GRANDE BASIN TO THE YEAR 2000,
New Mexico Univ., Albuquerque. Bureau of Business and Economic Research.
B. McDonald, and J. Tysseling.
Natural Recources Journal, Vol 22, No 4, p 855-876, October, 1982. 2 Fig, 10 Tab.

Descriptors: *Available water, *Water requirements, *Rio Grande, *Water use, *Forecasting, Water supply, Water demand, Domestic water, Agriculture, *New Mexico, Population dynamics, Rivers.

The present and future water demand and supply for the New Mexico Upper Rio Grande Basin was analyzed. Present water use within the region was determined, and the factors which restrict the water supply were examined. Population and economic activity within the region were projected to the year 2000 and were used to establish future non-agricultural water demand. A total increase in water use of 78,167 acre-feet was projected. Agricultural has not increased over the past ten years, so no increase was expected for the future. The largest increase (47,737 acre-feet) was in the domestic water use category due to population increases. Water supply was judged to be sufficient to meet the projected demand. Thus, water should not be a constraint on the economic growth of this region. The San Juan-Chama project water will make this sufficient water supply possible. (Small-FRC)
W83-03493

ANTICIPATING TRANSBOUNDARY WATER NEEDS AND ISSUES IN THE MEXICO-UNITED STATES BORDER REGION IN THE RIO GRANDE BASIN,
Texas Univ. at Austin. Center for Research in Water Resources.
N. E. Armstrong.
Natural Resources Journal, Vol 22, No 4, p 877-906, October, 1982. 6 Fig, 5 Tab.

Descriptors: *Water requirements, *Water supply, *Rio Grande, *Texas, *Mexico, Reservoirs, Water management, Water quality, Water quality managment, Urbanization, Population dynamics, Surface water, International agreements.

The present surface and groundwater available in the Rio Grande Basin in the Texas-Mexico border area is described, and water needs for the basin are forecast. Also, water-related issues in the transboundary area are identified. Resources include various streams and reservoirs, as well as the following Texas aquifers: El Paso, Salt Basin, Pecos Valley, Plateau, Carrizo-Wilcox, and Gulf Coast. City populations are expected to double in the next 30 years, causing increases in water demand. Total withdrawals from the Rio Grande are expected to decrease 11% by the year 2000 because of a 14% decrease in agricultural water use. Domestic use and manufacturing use are expected to increase. Water supply problems in the El Paso-Juarez area include surface water supply and water quuality degradation. The lower Rio Grande Valley may not have enough water to supply growing industries, while in the Pecos Valley deterioration of water quality due to natural brine emissions is a problem. Treaties between the US and Mexico control transboundary waters. (Small-FRC)
W83-03495

6E. Water Law and Institutions

WATER INDUSTRY ACCOUNTABILITY THROUGH THE OMBUDSMAN SYSTEM,
Birmingham Univ. (England).
M. J. Harley, and M. Hobson.
Water Services, Vol 86, No 1032, p 59-61, February, 1982. 5 Tab.

Descriptors: *Metropolitan water management, *Administration, Adjudication procedure, Utilities, *United Kingdom.

The United Kingdom has established several offices, institutions, and procedures for reviewing the administrative actions of public bodies during the period since 1967. The Parliamentary Commissioner for Administration (PCA) and the Commissions for Local Administration in England and Wales are the three offices having most jurisdiction over administrative acts of public bodies constituting the water industry. The Commissions for Local Administration for England and for Wales are responsible for handling complaints of alleged injustice through maladministration by water authorities and by statutory water companies in their capacities as agents of the water authorities. The lengthy complaint procedure used by the Local Commissions includes filing a complaint with the relevant authority and waiting for a response, filing a complaint with a member of the authority and waiting for that member to file the complaint with the Commission, and then direct filing with the Commission if the member fails to resolve the problem or to file with the Commission. The Local Com-

missions have issued 35 reports in cases in which at least one water authority was investigated, and there have been findings of maladministration by the water authority in 16 of these cases. Water supply and resources activities accounted for 40 percent of these investigations, while sewerage and sewage disposal accounted for 34 percent and land or field drainage issues accounted for 14 percent of the cases. (Carroll-FRC)
W83-03233

THE EVOLUTION OF CALIFORNIA STATE WATER PLANNING 1850-1928,
California Univ., Davis. Dept. of History.
W. T. Jackson, and D. J. Pisani.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-219782, Price codes: A14 in paper copy, A01 in microfiche. California Water Resources Center Completion Report, University of California, Davis, May 1983. 302 p, 594 Ref. OWRT A-075-CAL(1).

Descriptors: *History, *Irrigation, *California, Political aspects, *Planning, *Water policy, *State jurisdiction, Federal jurisdiction, Water supply development, Water rights, Legal aspects, Riparian rights, Appropriation, Water conveyance, Water supply systems, Public policy, Water rates, Water resources development.

This is a study of the evolution of irrigation, water law, and water resource planning in California from statehood until 1930, the year in which the first comprehensive state water plan was submitted to the legislature. It was designed to fill an important gap in the historical record. There is no comprehensive history of the development of water resources in California, or the arid West as a whole. Other topics considered included the evolution of 'court-made' water law; the conflict between federal and state reclamation at the turn of the 20th century; the development of the 'multiple-use' concept of water planning; and the evolution of the first state water plan. Our research has led to several conclusions. First, the development of a state water plan was much more than a scientific quest to promate agricultural efficiency, or even provide the 'greatest good for the greatest number.' For the controversies surrounding the state's role in water development invariably reflected broader political, economic, and social trends. Ultimately water policies were shaped as much by a vision of what California should or could become as by the more limited objectives of farmers. The state's failure to play a more active part in stimulating irrigation during the 19th century was not due to a laissez-faire philosophy of government, or even the assumption that the job was best done by private enterprise, but fear that any large-scale state expenditures would strengthen monopolies. Finally, the lawmakers came to realize that California was too fragmented into sections and special interests to achieve a coordinated, unified water plan.
W83-03274

A MANUAL FOR DEVELOPING SMALL-SCALE AND MICRO-HYDROPOWER PLANTS IN IDAHO - A GUIDE TO PERMITS, LICENSES, AND INCENTIVES,
Idaho Univ., Moscow. Dept. of Civil Engineering.
C. C. Warnick.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-221739. Price codes: A06 in paper copy, A01 in microfiche. Idaho Water and Energy Research Institute Completion Report, Moscow, April 1983. 107 p, 31 Fig, 6 Tab, 33 Ref, 1 Append. OWRT A-079-IDA(1). 14-34-0001-2114.

Descriptors: *Hydroelectric power, Hydraulic turbines, *Hydroelectric project licensing, Electric power, Federal Power Act, *Idaho, Evaluation assessment, Economic evaluation.

This manual has been prepared to assist potential developers of hydropower and to help agency personnel concerned with hydropower, planning and development in Idaho. It is designed to guide the developer through the various steps in preparing a feasibility study and completing the necessary licensing. The manual gives brief information on the engineering requirements and the economic analysis and references as to how to obtain necessary professional assistance. Necessary steps and actions that must be taken to obtain appropriate permits, licenses and compliance certification have been presented in sections involving local permitting, State law requirements, and Federal law requirements. This includes graphic flow charts, expected time requirements, and specific information on addresses and phone numbers to make necessary contacts. A brief discussion is presented on incentives for developing small-scale hydropower in Idaho, with information on financing possibiliies and requirements for developing power sales contracts. A very specific set of references for use of those working in Idaho is included. The manual includes in the Appendix a glossary and a list of hydroelectric turbine manufacturers.
W83-03320

FLOOD LOSS REDUCTION THROUGH INTERSTATE COMPACTS: AN UNDER-UTILIZED APPROACH,
Massachusetts Univ., Amherst. Dept. of Geology and Geography.
For primary bibliographic entry see Field 6F.
W83-03324

THE ESCATAWPA RIVER - AN INTERSTATE APPROACH TO WATER RESOURCE MANAGEMENT,
Mississippi Univ. Law Center, University.
A. L. Sage, III, and M. T. Gibbs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-224188, Price codes: A04 in paper copy, A01 in microfiche. Mississippi Water Resources Research Institute, Mississippi State, Completion Report, July 1982, 46 p. OWRT A-135-MS(1), 14-34-0001-1126.

Descriptors: *Water law, *Equitable apportionment appropriation, Riparian rights, *Interstate rivers, *Alabama, *Mississippi, Mass allocation, Mobile, *Escatawpa River, *Interstate compacts, Municipal water, California doctrine, Alternative supply, Reasonable use, Natural flow doctrine, Prescriptive rights, Big Creek(Alabama/Mississippi), Statutory appropriation.

The purpose of this study was to analyze the legal position of the states of Mississippi and Alabama in a conflict concerning the use of water from an interstate stream in the City of Mobile's municipal water supply. The report does not include an analysis of the legal positions of private individuals of Mobile except as they pertain to the legal positions of the states. Although the two states have legal systems that apply different rules to disputes over water rights the decisions of the United States Supreme Court do not indicate that either state's law would be the deciding factor in a dispute over the use of the stream in question. The rule applied by the Supreme Court is called the Doctrine of Equitable Apportionment and in essence holds that states have equal rights in an interstate stream. However, this does not mean the water is equally divided, but that a solution fair and equitable to both is sought by balancing the harm and benefits to both states if particular actions are taken. The report discusses in detail the factors previously used in achieving balancing of equities. Concluding that the expense, complexity and uncertainty of results are prohibitive in a Supreme Court suit, the report recommends negotiation of an interstate compact between Alabama and Mississipi. Provisions necessary to the successful working of a compact are discussed.
W83-03354

ADAPTING APPROPRIATION WATER LAW TO ACCOMMODATE EQUITABLE CONSIDERATION OF INSTREAM FLOW USES,
Utah Water Research Lab., Logan.
J. M. Bagley, D. T. Larson, and L. Kapaloski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-224394, Price codes: A06 in paper copy, A01 in microfiche. Utah Water Research Laboratory Completion Report, June 1983. 118 p, 4 Fig, 3 Tab, 26 Ref. OWRT B-189-UTAH(1), 14-34-0001-0279.

Descriptors: *Appropriation, *Water law, *Water rights, Legal aspects, *Instream flow, Environmental protection, Environmental quality, Aesthetics, Diversion, Water loss, Recreation, *Western U.S.

The increasing public interest in naturally flowing streams has fostered efforts to obtain their protection under existing state water laws. In this study, the water laws of Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming were examined and compared (1) with each other, and (2) against a set of salient criteria, to assess shortcomings in accommodating instream flow protections. It was determined that appropriation system has the essential features of and embodies legal principles that should allow the accommodation of instream flow values but, at this point in time, purchase of existing rights or the exercise of governmental reservation/withdrawal/appropriation authorities seem to be the primary options. Legislative, judicial, and administrative strategies for protecting instream flows apart from the normal appropriation process were reviewed. Certain legislative and administrative strategies hold premise as supplementary to the standard appropriation procedure. Likewise, private sector strategies utilizing contracts, easements, purchase of development rights, etc. need to be more thoroughly considered. Where instream flow protections do not justify preemptive rights and strategies, and if hydrologic imperatives are properly observed, the state administered appropriation systems can accommodate the instream flow need. However, the need for better technical information for establishing beneficial need for the many instream values, and for use in projecting the biologic-hydrologic consequences of particular instream flow regimes remains a stumbling block to the accommodation process.
W83-03379

THE MEANING OF THE GENERALLY ACCEPTED TECHNOLOGICAL STANDARDS FOR THE PLANNING, CONSTRUCTION, AND OPERATION OF WATER DISTRIBUTION FACILITIES (DIE BEDEUTUNG DER ANERKANNTEN REGELN DER TECHNIK FUR PLANUNG, BAU UND BETRIEB VON WASSERVERSORGUNGSANLAGEN),
Deutscher Verein des Gas- und Wasserfaches e.V., Eschborn (Germany, F.R.).
W. Merkel.
Gas- und Wasserfach: Wasser/Abwasser, Vol 122, No 3, p 105-111, March, 1981. 13 Ref. English abstract.

Descriptors: *Water law, *Water distribution, *Standards, *Construction, *Operating policies, Domestic water, Design standards, Legal aspects, *Federal Republic of Germany, Water policy, Safety, Construction materials.

Water law in most of the states of the Federal Republic of Germany requires the observation of the 'generally recognized technological standards' in the construction, operation, and maintenance of water distribution facilities. Domestic water installations are subject to the same requirements according to federal law. These laws were designed to assure public safety and act as a buffer between professionals and the public. 'Generally recognized technological standards' are interpreted in federal law as principles and solutions that have been implemented by those practicing in the appropriate field of technology -- practical proof of the standard's validity is required, while acceptance in the scientific literature alone is inadequate. The generally recognized standards are not usually part of the law itself but are recommendations. An exception to this is the incorporation (or fixed reference in a law) of the text of a technological standard into a law; this has the disadvantage of requiring a change in the law to effect a change in the standard -- the dynamic nature of technology is ignored. The sliding reference (making the standard binding in its current form) is usually dismissed as unconstitutional, because the legislator has thereby delegated his authority to the standard-defining group over which he has no control. (Gish-FRC)
W83-03441

DEVELOPMENT AND STATUS OF EMERGENCY DRINKING WATER SUPPLY IN THE FEDERAL REPUBLIC OF GERMANY AFTER PASSAGE OF THE WATER SAFEGUARDING LAW (ENTWICKLUNG UND STAND DER TINKWASSER-NOTVERSORGUNG IN DER BUNDESREPUBLIK NACH DEM WASSERSICHERSTELLUNGSGESETZ),
Wahnbachtalsperrenverband, Siegburg (Germany, F.R.).
For primary bibliographic entry see Field 5F.
W83-03458

EFFECTS OF WILDERNESS LEGISLATION ON WATER PROJECT DEVELOPMENT IN COLORADO,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 6G.
W83-03489

NEW MEXICO WATER LAW: AN OVERVIEW AND DISCUSSION OF CURRENT ISSUES,
New Mexico Univ., Albuquerque.
C. T. DuMars.
Natural Resources Journal, Vol 22, No 4, p 1045-1064, October, 1982. 7 Fig, 64 Ref.

Descriptors: *Water rights, *Appropriation, *Water management, Water allocation, Water permits, Water policy, Water law, Groundwater management, Jurisdiction, Termits, Political constraints, Institutional constraints, *New Mexico, Legal aspects, Reservation doctrine, State jurisdiction, Beneficial use.

New Mexico's water law is based on the prior appropriation system. The hydrological relationship between groundwater and surface water is acknowledged. All water resources are public property, but water rights may be acquired by individuals for beneficial use. The State Engineer is charged with administration of matters relating to appropriation, transfer, and distribution of water. Current declared underground water basins cover 73,546 sq miles of the state. Groundwater rights can be sold or transferred with respect to location and purpose. Limited transfers from surface to grondwater appropriations have also been allowed. Other agencies involved with administration of water rights include the Interstate Stream Commission and local conservancy districts. Problems facing water management in this state are: (1) interstate competition for groundwater from states that have no clearly defined groundwater mangement policy, (2) uncertainty created by unquantified Indian federal reserved water rights, and (3) the dilemma posed by the duty to protect capital investments in a means of groundwater diversion while promoting maximum utilization of water resources for present and future generations. (Cassar-FRC)
W83-03492

OVERVIEW OF GROUNDWATER LAW AND INSTITUTIONS IN UNITED STATES BORDER STATES,
Arizona Univ., Tucson. School of Law.
R. E. Clark.
Natural Resources Journal, Vol 22, No 4, p 1007-1015, October, 1982. 21 Ref.

Descriptors: *Water law, *Groundwater management, *State jurisdiction, *Legal aspects, Common law, Equitable apportionment, International law, Public rights, Regulations, Jurisdiction, Water rights, Texas, Arizona, New Mexico, California, Mexico, Groundwater.

Issues surrounding US border groundwater law are discussed, and interstate friction between border states and Mexico over groundwater withdrawals and transportation across state lines is considered. Texas, Arizona, and California follow common law property rules, while New Mexico water law is based on appropriation. Texas law permits unlimited groundwater withdrawals, while California relates the volume of groundwater withdrawn to overlying surface owenership or use. New Mexico has a statewide permit system; the resource is public until acquired. New Mexico was one of the first states to establish a groundwater management system. Arizona has a state administered system where there are controls over specific types of uses. Formal international cooperation between the US and Mexico is suggested to control border water supply and water quality. (Small-FRC)
W83-03496

TEXAS GROUNDWATER LAW: A SURVEY AND SOME PROPOSALS,
Texas Univ. at Austin. School of Law.
C. W. Johnson.
Natural Resources Journal, Vol 22, No 4, p 1017-1030, October, 1982. 41 Ref.

Descriptors: *Water law, *Texas, *Groundwater pollution, *Groundwater management, *Aquifers, Legal aspects, Water pollution, Water management, Groundwater, Judicial decisions, Common law, Regulations, Water rights, Drilling.

Groundwater law in Texas is surveyed, major weaknesses are made. The state legislature has not changed the common law of groundwater allocation as applied by the courts. Only in a few instances, such as recharge of aquifers, has the legislature addressed groundwater problems directly or authorized a state agency to do so. It has been active in protecting groundwater from pollution from a variety of activities including improper drilling of water wells; activitie associated with the development of oil, gas, other minerals, and geothermal resources; and disposal of wastes in dumps or underground. Local governments have a significant role in groundwater management. Problems in Texas include the virtual absence of law for resolving conflicts among pumpers, lack of coordination of groundwater and surface water rights, and absence of laws to prevent depletion of aquifers. (Small-FRC)
W83-03497

CALIFORNIA GROUNDWATER MANAGEMENT: THE SACRED AND THE PROFANE,
John Muir Inst., Berkeley, CA. Center for National Resource Studies.
G. Weatherford, K. Malcolm, and B. Andrews.
Natural Resources Journal, Vol 22, No 4, p 1031-1043, October, 1982. 49 Ref.

Descriptors: *Groundwater management, *Legal aspects, *Water rights, *Water supply, *California, Water shortages, Water law, Groundwater mining, Groundwater depletion, Subsidence, Aquifers, Groundwater recharge, Artificial recharge.

California pumps more groundwater than any other state in the union, yet it lacks a coordinated statewide managment program for the resource. California relies on an annual developed water supply of 42 million acre feet (MAF), of which about 15 MAF is pumped groundwater. Misuse of groundwater has caused problems, including threatened depletion is some areas, seawater intrusion, contamination by toxic compounds, and land subsidence. There is no coherent or comprehensive groundwater law or policy. Groundwater rights are defined by court-made law, and the regulation of groundwater occurs selectively in some water districts. Groundwater rights law involves correlative rights, appropriative rights, mutual prescription, and notions of equitable apportionment. Recharging of aquifers with imported water has been one way California has dealt with water supply problems. (Small-FRC)
W83-03498

6F. Nonstructural Alternatives

FLOOD LOSS REDUCTION THROUGH INTERSTATE COMPACTS: AN UNDER-UTILIZED APPROACH,
Massachusetts Univ., Amherst. Dept. of Geology and Geography.
R. H. Platt, and W. Nechamen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-221770, Price codes: A08 in paper copy, A01 in microfiche. Water Resources Research Center Publication No 137, Massachusetts University, Amherst, March 1983. 146 p, 4 Fig, 6 Tab, 40 Ref, 3 Append. OWRT A-137-MASS(1), 14-34-0001-1123.

Descriptors: *Flood control, *Interstate compacts, *Interstate rivers, *Water law, *Non-structural alternatives, Water management, Planning, Political aspects, Delaware River, Connecticut River.

The federal government has long wrestled with the conflicting priorities of state and federal jurisdiction. While federal authority over waterways has historically increased, states still maintain considerable jurisdictional prerogatives over land use and non-interstate water projects. However, local waterways often flow into larger streams whic gather water from portions of several states. In recent years, a 'partnership' policy between federal and nonfederal jurisdictions has grown as a preferred option necessitating increased interstate planning and cooperation: a difficult task to achieve when priorities conflict. Interstate compacts, which are essentially treaties between states, have been extensively utilized since the 1920's to allocate water in the Western States. In the East, compacts have been developed for pollution control and flood control, as well as for allocation. A limited flood control compact in the Connecticut River Basin and an extensive multipurpose federal-interstate compact in the Delaware River Basin are devices which could be used to mitigate interstate flooding problems. However, the Connecticut compact has never been effective beyond the narrow purpose of tax loss reimbursements. The Delaware compact could be more effective in the area of flood control. In both cases, only increased public awareness and perception of flood hazard are likely to effect greater utilization of existing compacts.
W83-03324

6G. Ecologic Impact Of Water Development

A 'BEFORE AND AFTER' STUDY OF THE EFFECTS OF LAND DRAINAGE WORKS ON FISH STOCKS IN THE UPPER REACHES OF A LOWLAND RIVER,
Liverpool Univ. (England).
S. Swales.
Fisheries Management, Vol 13, No 3, p 105-114, July, 1982. 5 Fig, 3 Tab, 31 Ref.

Descriptors: *Environmental effects, *Fish populations, *Channel improvement, Drainage effects, Soar River, *United Kingdom, Aquatic habitats, Habitats, Vegetation.

Fish populations were markedly changed in the upstream reaches of the River Soar, Leicestershire, after river channel works improved land drainage. The study site was a 100 m slow-flowing reach 1 m deep, with shallow riffles at its upstream and downstream limits and abundant bankside trees and vegetation. The drainage scheme consisted of river dredging and widening and vegetation clearance, designed to reduce flooding on 360 ha of agricultural land. Although water quality parameters, flow conditions, add bottom substrate before (5/5/77) and after (3/15/79) channel works were not different, there was a marked decrease in instream cover. Mean densities of fish $>$ 10 cm long were 0.160 per sq m before and 0.048 per sq m after the project. The mean standing crop of fish was 39.0 g per sq m before and 9.6 g per sq m after the project. Reductions in standing crop were: brown trout, 100%; chub, 81%; dace, 72%; and roach, 15%. (Cassar-FRC)
W83-03192

FISHERIES PRODUCTIVITY AND WATER LEVEL FLUCTUATIONS IN LAC SEUL, NORTHWESTERN ONTARIO,
Hanna (J.E.) Associates, Inc., Mississauga (Ontario).
J. E. Hanna, and M. F. P. Michalski.
Canadian Water Resources Journal, Vol 7, No 2, p 365, 388, 1982. 4 Fig, 9 Tab, 8 Ref.

Descriptors: *Reservoirs, *Water resources development. *Fisheries, *Ontario, Canada, Lac Seul, English River, Watersheds, Management, Water management, Planning, Decision making.

Lac Seul, located in the English River watershed in nothwestern Ontario, has been regulated for power production since 1935. The lake supports a sports and commercial fishery, with yellow pickerel, northern pike, lake whitefish, tullibee, and coarse fish dominating the harvest. Commercial harvest records date to 1924, and sports anglers' catches have been sampled on several occasions since 1960. An in-depth analysis of water levels and fisheries productivity revealed a number of relationships. First, significant increases in the yields of yellow pickerel and northern pike were associated with the initial flooding. Second, changes in water level regulation patterns appear to have had short term negative impacts on productivity. However, the fishery has adapted to the new regimes with little long term effect. Third, correlations between annual fish yields and minimum spring water levels as well as seasonal water level variations suggest a threshold response of the fishery, below which water level changes have had little or no effect. The implications of these results for reservoir design and management are considered. (Baker-FRC)
W83-03212

ASSESSING ENVIROMENTAL IMPACTS OF OPEN WATER DISPOSAL OF DREDGED SEDIMENT,
Colorado State Univ., Fort Collins.
G. F. Lee, and R. A. Jones.
World Dredging and Marine Construction, Vol 18, No 4, p 20-22, April, 1982. 6 Ref.

Descriptors: *Dredging, *Spoil disposal, *Bottom sediments, Water pollution effects, Measurement techniques, Environmental effects, Bioassay, Water quality standards.

Since 1970, significant research has been conducted to determine the effects of contaminants in dredged material on water quality and to investigate the environmental effects of dredged sediment disposal. Environmental effects of disposal of this material include both the physical impact of deposition of solid material on aquatic organisms in the area and the impact of the chemical contaminants associated with the sediments. Although research results have demonstrated that the total concentration of a contaminant in dredged material is not a reliable indicator of potential water quality problems associated with disposal of the sediment, some pollution control agencies still regulated dredging practice using bulk sediment criteria to evaluate the potential environmental impact of disposal of the material and to make decisions regarding the disposal method to be used. The U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers have developed the elutriate test and benthic organism bioassay test procedures as a substitute for bulk sediment criteria. However, the elutriate test grossly overestimates the amount of contaminant release that will occur when mechanically dredged sediments are dumped in open waters and is not a suitable tool for predicting the contaminant release in the overflow waters associated with areas of confined disposal. In addition, the bioassay procedures are not used as often as they should be in the formulation of disposal practices because they are too complex and excessively costly and because there are no guidelines for interpreting results. It is recommended that a bioassay screening test using only one type of organism be used to detect potential toxicity problems. The authors suggest that a site-specific hazard assessment, conducted to evaluate the potential environmental impact of open water disposal of dredged sediments, would lead to a more technically valid, cost-effective, and at least equally environmentally protective approach as that currently used. (Carroll-FRC)
W83-03251

THE EFFECTS OF ALTERED HYDROLOGIC REGIME ON TREE GROWTH ALONG THE MISSOURI RIVER IN NORTH DAKOTA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
P. W. Reily, and W. C. Johnson.
Canadian Journal of Botany, Vol 60, No 11, p 2410-2423, 1982. 11 Fig, 7 Tab, 34 Ref. OWRT B-108-VA.

Descriptors: *Dam effects, *Regression analysis, *Growth kinetics, *Trees, *Flood plains, *Water table decline, Environmental effects, Ecological effects, Growth rates, Oak trees, Cottonwood trees, Elm trees, Flow pattern, *North Dakota, Missouri River, Garrison Dam.

Tree growth increment cores were examined and related to changes in the hydrologic regime of the floodplain downstream of Garrison Dam on the Missouri River by multiple regression analysis. Cumulative growth of trees was also compared during two 20-year periods to determine predam and postdam growth patterns. Results showed significant decline in the postdam growth of Ulmus americana, Fraxinus pennsylvanica, Acer negundo, and Quercus macrocarpa due to alterations in seasonal streamflow patterns, near elimination of over-bank flooding, and apparent lowering of the water table during the early growing season following completion of the dam in 1953. Measured decline in growth of Populus deltoides was not statistically significant. The least affected trees were those on terraces at the edge of the floodplain receiving concentrated runoff from upland ravines and those with deep root systems on low terraces close to the water table. On high terraces that received little upland runoff, trees showed the most pronounced decreases in growth. Radial growth of P. deltoides showed a distinct change from correlation with spring streamflow in the predam period to correlation with rainfall parameters in the postdam period. On reference sites unaffected by the Garrison Dam, growth of P. deltoides and Q. macrocarpa increased significantly in the postdam period. (Geiger-FRC)
W83-03262

EVALUATION AND MONITORING OF THE HYDROLOGIC IMPACT OF CABIN CREEK, B.C. COAL PIT MINING ON THE NORTH FORK OF THE FLATHEAD RIVER,
Montana Univ., Missoula. Dept. of Geology.
C. Dalby.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-221788. Price codes: A09 in paper copy, A01 in microfiche. Montana Water Resources Research report no. 130, Montana State Univ., Bozeman, March 1983. 172p, 23 Tab, 31 Fig, 141 Ref. OWRT A-096-MONT(1); A-101-MONT(1). 14-34-0001-6027,7055,7056.

Descriptors: *Coal mines, *Sediment yield, *Sediment transport, *Geomorphology, Erosion, Water quality, Reclamation, Fluvial sediments, Channel mapping, Gravel-bed river, North Fork Flathead River, Cabin Creek, Glacier National Park, Montana, Canada, *British Columbia.

The North Fork of the Flathead River forms the northwestern boundary of Glacier National Park in Montana and originates in the province of British Columbia. Sage Creek Coal Ltd. plans to develop metallurgical grad coal deposits contained in two large hills, one on either side of Cabin Creek, a tributary of the North Fork located 8 miles north of the Canadian border. The climate of the area, steepness of terrain, composition of overburden, and contour-strip style of mining, indicate a high potential for erosion and sediment production. Introduction of coarse bed-material sediment into the North Fork as the result of mining could alter downstream channel processes and the shape of the channel. The fluvial geomorphology of the channel extending from the Canadian border to the Middle Fork Flathead River was mapped and classified at 1:24,000 scale. The analysis shows that the North Fork is similar to other gravel bed rivers and provides a basis for estimating the effect of increased sediment loads on channel morphology. The total sediment yield at the Cabin Creek mine site was estimated to be about 1.2 million tons over the 21-year mine life. A 50% reduction in this yield, through partly successful reclamation, would still allow the contribution of about 60,000 tons per year to the North Fork's annual total load of the North Fork at the Canadian border. An increase of this magnitude would significantly affect downstream water quality, channel processes, and morphology. Recommendations for a sediment monitoring program are given.
W83-03325

AGRICULTURAL STREAM ECOSYSTEMS: STRUCTURE AND FUNCTION FOR UNDERSTANDING WATER QUALITY IMPROVEMENTS,
Iowa State Univ., Ames. Dept. of Animal Ecology.
J. B. Barnum, and R. W. Bachmann.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-224261, Price codes: A06 in paper copy, A01 in microfiche. Iowa State Water Resources Research Institute Publication No 124, March 1983. 113 p, 22 Fig, 37 Tab, 49 Ref. OWRT A-079-IA(1), 14-34-001-0017.

Descriptors: *Agricultural watersheds, *Decomposition, *Primary production, Water quality, *Invertebrates, Streams, Riparian, Vegetation, *Land use, Impacts, Phosphorus, Chlorophyll a, Suspended solids, Nitrogen.

Twelve emphemeral to perennial stream sites within eight agricultural watersheds were studied in order to define key ecological processes regarding in-stream functional adjustments to agricultural watershed impacts. The ecological processes or indices investigated were detrital decomposition, primary production, invertebrate community structure, water quality and analyses of watershed land use practices. The drainages were differentially impacted by intensive row crop development, grazing, removal of riparian vegetation, channelization and drainage tiling. All sites displayed impaired water quality (e.g. high nutrient and suspended solid concentrations), although tree-shaded sites displayed cooler summertime temperatures and significantly faster decomposition rates than open canopy sites. Decomposition dynamics were associated with invertebrate shredder communities. Open sites transported higher suspended chlorophyll a concentrations, displayed greater attached algal biomass, exhibited wider diurnal oxygen fluxes, and were dominated by collector-scraper invertebrate assemblages compared to tree-shaded sites. Agricultural streams were compared with other less impacted drainages, traditional stream concepts were explored, and a conceptual agricultural stream model was proposed. This study identifies land use practices qualitatively implicated in impairing stream water quality. However, large scale watershed manipulation experiments will be necessary inorder to quantitatively predict the effects of agricultural land use practices on stream water quality.
W83-03377

ENVIRONMENTAL PROBLEMS OF RESERVOIR DEVELOPMENT WITH SPECIAL REGARD TO CONDITIONS IN SWEDEN,
Uppsala Univ. (Sweden). Naturgeografiska Inst.
A. Sundborg.
Canadian Water Resources Journal, Vol 7, No 2, p 2-22, 1982. 4 Fig, 17 Ref.

Descriptors: *Hydroelectric power, *Environmental effects, *Reservoirs, Dam construction, *Sweden, Fisheries, Fish populations, Aquatic biota, Sediment transport, Erosion, Water quality, Vegetation, Animal life.

Environmental problems of reservoir development are considered with special regard to hydroelectric power development in Sweden. Methods are outlined for predicting and evaluating the environmental impact and for reducing effects of reservoir construction by corrective and complementary measures. A brief review is offered of effects on local climate, water stages, water discharges, stream conditions, ice conditions, groundwater, shoreline erosion, sediment transport, water quality, sediment deposition, vegetation and animal life, including aquatic fauna and fish populations. Decisions on future use of natural resources should be

based on a sufficient knowledge of possible effects, gained by environmental study programs. Corrective and complementary measures aimed at a preservation of as much as possible of the original landscape characteristics are noted. Compensation for decreased fish production and the establishment of facilities for tourism and recreation are also mentioned. Speaking generally, the development of hydropower may involve marginal advantages to the total electricity production system in Sweden. However, hydropower is especially valuable because of its ease of regulation and its immediate adaptability to the fluctuations in electric energy demand. (Baker-FRC)
W83-03393

AQUATIC ECOLOGY MONITORING NETWORK OF THE JAMES BAY POWER CO. (LE RESEAU DE SURVEILLANCE D'ECOLOGIE AQUATIQUE DE LA SOCIETE D'ENERGIE DE LA BAIE JAMES),
D. Roy.
Canadian Water Resources Journal, Vol 7, No 1, p 229-250, 1982. 8 Fig, 1 Tab, 28 Ref. English summary.

Descriptors: *Monitoring, *Environmental effects, *Reservoirs, Forecasting, Primary productivity, Phytoplankton, *James Bay, *Quebec, Canada, Zooplankton, Benthos, Fish.

The James Bay Power Company (SEBJ) set up an ecological monitoring network in 1977 designed to evaluate the changes in the environment resulting from the creation of reservoirs in Northern Quebec. This information may be of use in later years to improve the methods of predicting impact and to assist specialists in choosing appropriate remedial measures. Generally, systematic observations are made at stations located either on the three main reservoirs or nearby. Baseline data were obtained on various physical chemistry parameters, primary production, phytoplankton, zooplankton, benthos and fish. Conventional mathematical analysis was used to reveal the relationships existing between these parameters. The main changes observed during the first four years that the network has been in operation included slight decreases in dissolved oxygen at the surface and greater decreases near the bottom. Acidification of the reservoirs occurred after the beginning of impoundment due to decomposition of organic matter and leaching of soils with low buffering capacity. Species diversity of plankton decreased, and relative populations of different fish species were altered, although the total fish harvest increased slightly. (Baker-FRC)
W83-03394

AN EVALUATION OF PROPOSED CAGE FISH CULTURE ON LOCH LOMOND, AN IMPORTANT RESERVOIR IN CENTRAL SCOTLAND,
Stirling Univ. (Scotland). Inst. of Aquaculture.
M. Beveridge, and J. F. Muir.
Canadian Water Resources Journal, Vol 7, No 2, p 181-196, 1982. 3 Fig, 1 Tab, 32 Ref.

Descriptors: *Fisheries, *Lakes, *Environmental effects, Water quality, Loch Lomond, *Scotland, Fish, Water resources development, Planning, Decision making, *Aquaculture.

Proposals to farm rainbow trout in Loch Lomond, the largest and one of the most important reservoirs in the United Kingdom, are evaluated. The suitability of the Loch is assessed in terms of existing water quality, and optimum sites are chosen on the basis of depth of water, exposure, access, risk from pollution, security and planning regulations. The environmental impact of different size production units is calculated on the basis of phosphorus and nitrogen loadings, and permissible production figures are suggested in the light of current constraints on Loch Lomond as a source of drinking water and as a recreational facility. A study of the environmental impact of wastes for a large cage fish farm is briefly described. (Baker-FRC)
W83-03403

THE DEVELOPMENT AND EFFECT OF FISH ATTRACTORS ON THE TENNESSEE-TOMBIGBEE WATERWAY,
Corps of Engineers, Mobile, AL. Mobile District.
K. R. Sims.
Canadian Water Resources Journal, Vol 7, No 2, p 163-171, 1982. 1 Fig, 9 Ref.

Descriptors: *Reservoirs, Construction, *Environmental effects, *Planning, Decision making, Management, Water resources development, Lakes, Fish, *Fish attractors, *Tennessee-Tombigbee Waterway.

A pre-construction planning effort is described whereby fish attractors were designed and incorporated into the lakes along the Tennessee-Tombigbee Waterway (TTW). Reservoir clearing practices were modified, and naturally occurring resources were used to construct approximately 150 fish attractors in nine lakes. The approximately one hectare fish attrators were composed of stumps, about one meter high, and shrub growth, all of which are naturally attached to the lake's bottom. The effects of the fish attractor design on the sport and commercial fisheries, water quality, and public safety of the TTW lakes are also discussed. (Baker-FRC)
W83-03419

DEVELOPMENT OF A RESERVOIR PREPARATION STRATEGY,
Newfoundland and Labrador Hydro, St. John's.
D. J. Kiell.
Canadian Water Resources Journal, Vol 7, No 2, p 112-131, 1982. 3 Fig, 4 Tab, 16 Ref.

Descriptors: Water resources development, *Environmental effects, *Reservoirs, Littoral zone, Fish, Recreation, Water use, Dams, Construction, Planning, Decision making, Management, *Newfoundland.

The value of a reservoir preparation study approach is considered in light of actual clearing costs incurred during construction, the reaction of regulatory agencies, and similar studies completed on other proposed reservoirs in the Province of Newfoundland. An exercise to determine an effective reservoir preparation strategy was begun during the environmental assessment of the Upper Salmon Project, a proposed hydroelectric development in Newfoundland. The study examined forestry resources and wildlife habitat and use in the flood zone. Also considered was the predicted littoral zone development, water quality changes and fisheries impacts. The recommended action was to completely clear selected areas of the reservoir (about 57%), mainly in response to requirements of migrating caribou and in order to enhance recreation potential. Forest areas underlain by gravel material were to be cleared to create salmonid spawning beds in the reservoir. A 200 meter strip between Great Burnt Lake and Crooked Lake was to be cleared to enhance movement to boats between these lakes, and a 200 m strip through the diversion channel areas was also to be cleared. (Baker-FRC)
W83-03420

THE EVOLUTION OF PUBLIC INVOLVEMENT IN RESERVOIR DEVELOPMENTS IN CANADA,
Beak Consultants Ltd., Toronto (Ontario).
W. Eedy, and H. Howes.
Canadian Water Resources Journal, Vol 7, No 2, p 289-304, 1982. 4 Fig, 18 Ref.

Descriptors: *Public participation, *Reservoirs, Water resources development, *Decision making, Planning, Social participation, Management, Water supply, Water management, *Canada.

The evolution of socio-economic impact studies and public involvement requirements related to reservoir development and management across Canada are reviewed. The extent of public involvement in impact assessments of reservoir developments is a function of a variety of factors, including government requirements, geographic location, time, and expectations of the public as well as the client. Environmental and socio-economic studies are compared for reservoir developments in Nova Scotia, Labrador, Ontario, and Saskatchewan. These span a 6 yr period in which federal and provincial guidelines as well as public environmental awareness have evolved considerably. These projects also allow a comparison of public and government expectations relevant to socio-economic studies and public participation in regions with great variation in lifestyle, resource values, and environmental awareness. The public and political concerns raised through these projects ranged from Native land claims and resource uses, through recreational property values, to effects on semiwilderness parkland and loss of prairie farmland. Political ramifications included dealing with diverse ethnic, cultural, and social backgrounds. Innovative public participation approaches were required to convey technological understanding of the engineering and environmental study programs as well as to solicit accurate expressions of concerns over the developments. The increasing importance of public involvement in the decision process is emphasized. (Baker-FRC)
W83-03421

HYDROBIOLOGY OF THE LITTORAL ZONE OF THE DNIEPER ESTUARY UNDER CONDITIONS OF REGULATED FLOW OF THE RIVER,
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
M. N. Dekhtyar, L. N. Zimbalevskaya, Y. V. Pligin, N. V. Pikush, and G. A. Goshovskaya.
Hydrobiological Journal, Vol 18, No 1, p 16-21, 1982. 6 Tab, 11 Ref.

Descriptors: *Environmental effects, *Dam effects, *Littoral zone, Water resources development, Dnieper Estuary, Kremenchug Reservoir, Flow regulation, River flow, Invertebrates, Fisheries, Bogs, Reservoirs, Ecosystems, Sediments, Salinity, Biomass, Phytoplankton, Bottom sediments, Estuaries, Shallow water, Benthos, *USSR.

Hydrobiology of the littoral zone of the Dnieper Estuary was studied after construction of 4 dams in the upper river (1956-66) and before the proposed damming of the Dnieper-Bug Estuary. In 1978 freshwater and brackish water organisms became predominant in the littoral zone because the estuary had been freshened to oligohaline in the east and central zones and to mesohaline in the west zone. Biomass of invertebrates and the contribution of oxyphilic species also increased greatly between 1964 and 1978. These changes were caused by regulation of the river flow, which prevented seawater intrusion and extreme changes in water level. At present about 35% of the shallow zone is occupied by silty sediments rich in organic matter and low in invertebrate biomass. The remainder of the shallow zone consists of sand and shell bottom occupied by oxyphilic organisms. Comparison of biomasses in the littoral zones of the existing Kremenchug Reservoir and the undammed Dnieper estuary shows that the Kremenchug has a much smaller density of phytobenthos (4.57 g per sq m) and zoobenthos (10.17 g per sq m) than the undammed estuary, 21.60 g per sq m of phytobenthos and 79.43 g per sq m of zoobenthos. From these observations it is believed that damming the estuary could severely harm or destroy the fishing industry in this area as a result of flow reduction, increase in areas of stagnant water, expansion of the zone of reduced bottom soils, and promotion of bog formation. These conditions discourage growth of invertebrate fish food organisms. (Cassar-FRC)
W83-03480

EFFECTS OF WILDERNESS LEGISLATION ON WATER PROJECT DEVELOPMENT IN COLORADO,
Colorado State Univ., Fort Collins. Dept. of Economics.
G. D. Weaver.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-226910, Price codes: A08 in paper copy, A01 in microfiche. Colorado Water Resources Research Institute Completion Report, Fort Collins, May 1983. 156 p,

7 Fig, 28 Tab, 157 Ref. OWRT A-044-COLO(1), 14-34-0001-9006 & 0106.

Descriptors: *Wilderness areas, *Environment, *Wildlife conservation, *Wildlife habitats, *Wildlife management, *Wild rivers, *Rivers, *Fish, *Water supply, *Project planning, *Enviornmental effects, *Legislation.

Environmental policies embodied in the Wilderness Act, Wild and Scenic Rivers Act, and Endangered Species Act impose certain restrictions on the development of Colorado's water resources. Planning costs are unavoidably increased because time and personnel must be invested in complying with procedural reequiements of the laws. Capital or operating costs may be increased because of construction delays, required engineering design changes, or spatial relocation of project facilities. In some cases, development opportunities will be completely foregone. The most pervasive conflicts identified in this study involve the endangered whooping crane and Colorado River fishes. New streamfow depletions in the Platte River system will adversely affect the whooping crane habitat in central Nebraska if such depletions occur between February 1-May 10 or September 16-November 15. Accordingly, new development will be given nonjeopardy biological opinions only if they can meet the required flow regime, either by providing storage releases or replacement waters, or if they can offset the effects of small depletions by funding habitat improvement programs. Approval of projects affecting the Colorado River fishes have already been made contingent upon project operators adopting or funding various conservation measures, including the bypassing of minimum flows during critical months of the year.
W83-03489

7. RESOURCES DATA

7A. Network Design

LANDSAT MONITORING OF IRRIGATED FARMLAND ACREAGE IN CURRY COUNTY, NEW MEXICO,
New Mexico Univ., Albuquerque. Technology Application Center.
M. Inglis, and T. K. Budge.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220566, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Institute Technical Report No 165, New Mexico State Univ., Las Cruces, February 1983. 46 p, 16 Fig, 4 Tab, 9 Ref. OWRT A-069-NMEX(1), 14-34-0001-1133.

Descriptors: *Irrigated land, *Remote sensing, Groundwater mining, Acreage, Phenology, *Image processing, *Landsat satellite, *Classification, *New Mexico, Curry County.

Groundwater depletion is an increasing problem in the High Plains and poses economic difficulties in eastern New Mexico. Farming practices must change to adjust to the supply of irrigation water. A method to improve on the time and labor currently required to measure irrigated acreages would help to better predict the future supply of groundwater. Curry County, New Mexico, was selected as the study area to test the applicability of Landsat satellite digital data in making accurate acreage measurements of irrigated cropland. Due to its digital format, large image area, and repeating coverage, Landsat data have been found to be excellent for large area resource inventories. Three Landsat digital images of the 1981 growing season were classified for Curry County to determine (1) how well Landsat classified irrigated lands in the area, (2) how accurate Landsat acreage measurements could be, and (3) how many Landsat overpass dates would be required to accurately measure irrigated acreage. Results showed that three times periods of Landsat data produced an acreage count which was 94.4% of the official published figure. This report describes the methodology employed and makes recommendations for an operational yearly inventory of New Mexico cropland using satellite data.
W83-03310

EVALUATION AND ACCESSING OF DATA FOR A WATER RESOURCES SIMULATOR,
Arkansas Univ., Fayetteville. Dept. of Agricultural Engineering.
R. C. Peralta, R. Arce, and T. Skergan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222232, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Center Publication No 91, Univ. of Arkansas, Fayetteville, March 1983. 29 p, 19 Ref, 4 Append. OWRT A-060-ARK(1), 14-34-0001-2104.

Descriptors: *Data collections, *Monitoring, *Data acquisition, Well data, Groundwater management, Grand Prairie, *Arkansas.

An evaluation was made of the availability of data needed to use a groundwater simulation model for real time conjunctive water management in the Arkansas Grand Prairie. It is assumed that the goal of such management is to protect existing groundwater rights by maintaining water levels so that wells do not go dry, even in time of drought. Suffucient hydrogeologic data exists to use the simulation model to predict the effect of known pumping rates on groundwater levels. Developing an optimal set of 'target' levels and annually managing pumping to achieve those levels requires additional data: fall groundwater levels, degree of connection between aquifer and recharge streams, and annual cell by cell prediction of aquaculture and irrigated agriculture acreages. Successful management also requires continuous monitoring in the critical area where saturated thicknesses are small.
W83-03334

7B. Data Acquisition

SAMPLING MACROFAUNA IN DITCHES,
Utrecht Rijksuniversiteit (Netherlands). Dept. of Landscape Ecology and Nature Management.
B. Beltman, and W. Rietveld.
Hydrobiological Bulletin, Vol 15, No 3, p 153-159, December, 1981. 4 Fig, 16 Ref.

Descriptors: *Macroinvertebrates, *Sampling, *Ditches, Aquatic animals, Water quality, Water analysis, Water pollution effects, Biological communities.

Techniques for sampling macrofauna were compared for the purpose of determining the optimum method for sampling in ditches. For total macrofauna, use of a standard net method is preferable to sampling with the bottomless cage, dredge, macrofauna shovel, substrate sample, and metal wire kitchen sieve. A 5 m standard net sample is considered a minimum for a representative sample. If several habitats are present, the sample size should be increased to include them. A selective sample (collecting all animals within a 1.5 meter compartment of a ditch) gave a reasonable indication of the fauna, about 50-60% of the total 145 taxa revealed by standard net sampling. The sampling method should be designed according to the purpose of the survey, which may be total macrofauna or correlations between plant species and macrofauna taxa.
W83-03217

CONTRIBUTION TO THE MEASUREMENT OF EVAPORATION IN REMOTE STATIONS (BEITRAG ZUR VERDUNSTUNGSMESSUNG IN ABGELEGENEN STATIONEN),
Salzgitter A.G. (Germany, F.R.).
H. Wittenberg.
Wasserwirtschaft, Vol 71, No 1, p 6-9, January, 1981. 5 Fig, 7 Ref. English Abstract.

Descriptors: *Climatic data, *Weather, *Measuring instruments, *Evaporimeters, *Field tests, Climates, On-site tests, Evaporation pans, Evaporation, Deserts, Arid lands, *Egypt, Sahara Desert.

For a climatological station in the Egyptian Sahara, where regular attendance could not be guaranteed, two types of evaporimeters were installed and their performance was compared. A Class-A pan with a supply tank and inflow regulator and a Czeratzki ceramic evaporimeter with recorder and automatic filling device were each installed, and a twelve month record of data was obtained. Regression analysis of the data revealed close correlations, with a coefficient of 0.89. Both instruments produce high quality data. (Titus-FRC)
W83-03225

FIELD RATING EVALUATION OF A LARGE SUPERCRITICAL MEASUREMENT FLUME,
D. L. Chery, and R. E. Smith.
ISA Transactions, Vol 21, No 1, p 55-60, 1982. 8 Fig, 1 Ref.

Descriptors: *Flumes, *Flow measurement, *Ephemeral streams, Walnut Gulch, Watershed, *Arizona, Sediment transport, Sediment-carrying capacity, Sediment load, Stream discharge, Streamflow, Asymmetrical flow, Open-channel flow, Flow velocity, Flow characteristics, Flow profiles, Flood flow, Flow pattern, Hydraulic profiles, Flash floods, Channel flow.

Eleven supercritical flumes were developed for measuring flow in the Walnut Gulch watershed, Arizona, where ephemeral flows often carry heavy and variable sediment loads. Accurate measurement of discharges in ephemeral streams is difficult because of these high velocities, the sediment-carrying capacity of high velocities, and temporal variations of the stream bed shape and local flow direction. Number 6 flume was fitted with special instrumentation capable of measuring the extremes in flow velocity and water depth. During 1974-77 15 flow events were measured, of which four were chosen as representative of the range of average flow depths, 0.38-0.89 m. Discharges were 1.81-29.3 cu m per sec. Velocity contours, surface profiles and rating relations for these four events showed that asymmetrical flow at depths up to about 1 m produced measurement bias. At flows above 1 m in depth, measured and calculated discharges agree more closely. Porous control dikes installed in the upstream channel significantly improved the symmetry and rating relations for flows in the flume throat. (Cassar-FRC)
W83-03239

OPPORTUNITIES AND POTENTIAL BENEFITS OF RADAR RAINFALL MEASUREMENTS FOR THE FEDERAL REPUBLIC OF GERMANY (MOGLICHKEITEN UND POTENTIELLER NUTZEN EINES BUNDESDEUTSCHEN NIEDERSCHLAGSRADAR-VERBUNDSYSTEMS),
Deutscher Wetterdienst, Hohenpeissenberg (Germany, F.R.). Meteorologisches Observatorium.
W. Attmannspacher, and G. Schultz.
Wasserwirtschaft, Vol 71, No 1, p 1-5, January, 1981. 8 Fig, 1 Tab, 12 Ref.

Descriptors: *Measuring instruments, *Precipitation, *Climatic data, *Hydrologic data, *Electronic equipment, Rainfall, Hydrologic data collection, Radar, Rain gages, Meteorological data collections, Electrical equipment, *Federal Republic of Germany.

A method of measuring area precipitation was developed by researchers at the Hohenpeissenberg Observatory. This method has usefulness in various branches of science, including hydrology and meteorology, and would be of particular benefit in detecting flood problems. Rainfall measurements are computed from a conversion formula based on radar pulses emitted from electronic rainfall detectors. The results lead to isohyet maps with greater detail than those obtained by conventional methods, and the transformed data is available within one hour after the storm event. (Titus-FRC)
W83-03240

ON THE ESIMATION OF THE ERROR OF SOIL MOISTURE MEASUREMENT BY MEANS OF A NEUTRON SCATTERING PROBE (ZUR ABSCHATZUNG DES FEHLERS DER BODENFEUCHTE-MESSUNG MIT EINER NEUTRONENSONDE),
Freiburg Univ. (Germany, F.R.).
G. Morgenschweis.

Wasserwirtschaft, Vol 71, No 1, p 10-15, January, 1981. 4 Fig, 3 Tab, 21 Ref. English abstract.

Descriptors: *Soil moisture meters, *Soil water, *Soil density probes, *Measuring instruments, *Calibrations, Soil properties, Soil density, Field tests, On-site tests, Sites, Errors.

The problems of soil moisture measurement by means of a neutron scattering probe and its errors are demonstrated for an example of loessial sites in the Kaiserstuhl. Studies were conducted on soil horizons to a depth of 10 meters. An approach to field calibration which considers dry bulk density is presented. Soil moisture measurements are considered among the most difficult of hydrological measurements; the instrumental error of the ratemeter and the error in determining soil density are used to estimate the error of the soil moisture measurements. (Titus-FRC)
W83-03242

MONITORING OF GROUNDWATER LEVELS FOR REAL-TIME CONJUNCTIVE WATER MANAGEMENT,
Arkansas Univ., Fayetteville. Dept. of Agricultural Engineering.
R. C. Peralta, V. Mazur, and P. Dutram.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-222224, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Center Publication No 92, Univ. of Arkansas, Fayetteville, March 1983. 23 p, 2 Fig, 3 Ref, 6 Append. OWRT A-061-ARK(1), 14-34-0001-2104.

Descriptors: Grand Prairie, *Groundwater level, *Monitoring, Aquifer management, *Data acquisition, *Arkansas.

Water users in the Arkansas Grand Prairie wish to maintain sufficient groundwater levels to: insure adequate groundwater reserves for time of drought, protect themselves from litigation caused by wells going dry, and insure a sustained yield. Achievement of these goals requires regular measurement of groundwater levels. Review of monitoring practice and technology indicates that spring and fall measurements taken over the entire area using steel tape and acoustic device is preferred for most long range planning. Continuous monitoring is indicated for critical parts of the region where saturated thicknesses are small. Desirable attributes of a data collection/transmission system for such areas are as follow: Date should be stored in digital format on machine readable medium. Collection device should be installable in existing wells and not require special well construction. Device should be able to monitor pump status, and time and water level at programmable intervals. Device should be upgradable to be able to transmit data as it is collected. A system which has these capabilities was built. It consists of an acoustic probe, interface, computer and cassette recorder.
W83-03333

RAINFALL CELL SIZE FROM RIT CURVE ANALYSIS,
Hawaii Univ. at Manoa, Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2B.
W83-03339

CHARACTERIZATION OF KEL-F-GRAPHITE COMPOSITE (KELGRAF) ELECTRODES AND APPLICATION TO DETECTION IN FLOWING STREAMS,
North Dakota State Univ., Fargo. Dept. of Chemistry.
D. E. Tallman, and D. E. Weisshaar.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-224204, Price codes: A12 in paper copy, A01 in microfiche. North Dakota Water Resources Research Institute Completion Report, North Dakota State University, Fargo, January 1983. 258 p, 92 Fig, 20 Tab, 97 Ref. OWRT B-055-NDAK(1).

Descriptors: *Electrodes, *X-Ray spectroscopy, Heterogeneity, Electron microscopy, Electrochemistry, Groundwater, *Phenols, Analytical technique, Instrumentation, Prototype tests, *Chronoamperometry, *Pollutant identification, Chemical analysis.

The active area of Kel-F-graphite composite (Kelgraf) electrodes determined from short time chronoamperometric data agree well with the weight percent of graphite in the composite and with the percent conducting carbon on the surface determined from X-ray photoelectron spectroscopy (XPS). the model of Gueshi et al. (1) for partially blocked electrode surfaces was modified by introducing heterogeneity in the form of two different active site sizes. This modified model was fit to the chronoamperometric data by a simplex optimization of model parameters to determine the average active and inactive site radii on Kelgraf electrode surfaces. These radii are in agreement with those estimated from scanning electron microscopy (SEM). The performance of Kelgraf as an electrode for electrochemical detection in flowing streams is discussed, including the determination of the optimum electrode composition and the linear dynamic range of the detector. The detector was applied to the determination of phenols in groundwater and coal gasification wastewater. Detection limits ranged from 3-15 pg for a variety of phenols. No fouling of the electrode was evident. Evidence based on chronoamperometry, XPS, SEM, cyclic voltammetry, and capacitance measurements point to the existence of a partial thin film of Kel-F over portions of the graphite sites. The implications of the presence of such a film are also discussed.
W83-03369

A METHOD FOR IMPROVING CHEAPLY THE TIME RESPONSE OF PRESSURE-TRANSDUCER TENSIOMETER SYSTEMS,
Rothamsted Experimental Station, Harpenden (England).Dept. of Physics.
G. D. Towner.
Agricultural Water Management, Vol 5, No 4, p 285-293, December, 1982. 3 Fig, 5 Tab, 7 Ref.

Descriptors: *Pressure-measuring instruments, *Tensiometers, Soil water, Gages, Manometers, Transducers.

The time response of a system with multiple tensiometers scanned by a single pressure transducer is theoretically reduced by connecting a deformable cell to the cup. If this cell is disconnected immediately after the transducer has been exposed to it, the soil water pressure reading can be obtained in much less time. A Bourdon gage is sensitive enough to fulfill the theoretical requirements; a mercury manometer is not. (Cassar-FRC)
W83-03409

USE OF SEEPAGE METERS AND MINI-PIEZOMETERS FOR IDENTIFICATION OF RESERVOIR - GROUNDWATER INTERACTIONS IN LAKE MEAD, NEVADA,
Montana Univ., Missoula. Dept. of Geology.
W. W. Woessner, and K. Sullivan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-226894, Price codes: A02 in paper copy, A01 in microfiche. Water Resources Center, Desert Research Institute. Publication No 41082, Nevada Univ., Las Vegas, May 1983. 12 p, 8 Fig, 18 Ref. OWRT A-097-NEV(1), 14-34-0001-0130.

Descriptors: Bank storage, *Piezometers, *Seepage meters, Groundwater movement, *Nevada, *Surface-groundwater relations, *Lake Mead, *Groundwater-reservoir interactions.

The effectiveness of the seepage meter and portable piezometer in evaluating groundwater-reservoir interactions was evaluated over 12 months at Echo Bay in Lake Mead. Three standard piezometers constructed on shore, a refraction seismic technique and water chemistry data were utilized to interpret seepage device effectiveness. During a period of an 8 ft (2.4 m) rise in reservoir stage (12-79 to 3-80) the reservoir contributed water to bank storage at rates of up to 0.29 gpd/ft super 2 (12 lpd/m super 2). Groundwater discharge occurred for the remainder of the project, during a stage decline (4-80 to 5-80), a rise (6-80) and leveling off and slight decline for the remainder of the year (7-80 to 12-80). The maximum seepage meter groundwater discharge rate was recorded in December 1980, 3.0 gpd/ft super 2 (122 lpd/m super 2). Analysis of water quality data showed June discharge was principally at low TDS sodium-calcium-sulfate water similar to Lake Mead water quality. September data showed two possible components of discharge, bank storage water and high TDS calcium-sulfate groundwater. December groundwater discharge water quality data showed a high TDS calcium-sulfate water at all seepage meter locations and in wells 2A and 2B. Mini-piezometer data was collected at each seepage meter site, however data usually did not provide correlative results with seepage meter data. Suspended sediment in the piezometer water column and plugging of the perforated tip are suggested to explain unreliable results.
W83-03487

7C. Evaluation, Processing and Publication

HYDROLOGY OF AREA 14, EASTERN COAL PROVINCE, KENTUCKY,
Geological Survey, Louisville, KY. Water Resources Div.
F. Quinones, D. S. Mull, K. York, and V. Kendall.
Geological Survey Open-File Report 81-137 (WRI), August 1981. 82 p, 37 Ref, 7 Append.

Descriptors: *Hydrologic data, *Water quality, *Groundwater, *Surface water, *Strip mines, Geohydrology, Acid mine drainage, Water pollution sources, *Kentucky, Eastern Coal Province, Kentucky River basin, Licking River basin, Red River basin.

The general hydrology of Area 14, Eastern Coal Province, in Kentucky, is described. The area includes 4,423 square miles in the Kentucky, Licking, and Red River basins. Coal-bearing rocks of Pennsylvanian age underlie most of the area. Coal production in 1978 was about 38 million tons, 65% of which was from surface mining. The drainage from the mined areas contains large amounts of dissolved solids. Sulfate, manganese, and iron concentrations in most of the area streams exceed background levels, with the higher concentrations in streams draining the headwaters of the North and Middle Forks of the Kentucky River. The pH of most of the streams is near neutral acid-mine drainage being partially neutralized close to its source. Ground waters in the upper 300 feet of the aquifers are generally suitable for most purposes, although dissolved iron is generally high. Below 300 feet, the water is saline. Yields to wells range from 1 to 325 gallons per minute. A network of 66 surface quantity and quality of water stations was implemented in 1979 in response to the Surface Mining and Reclamation Act of 1977. An intensive study of the ground water resources of the area is also in progress. (USGS)
W83-03355

WATER TYPE AND SUITABILITY OF OKLAHOMA SURFACE WATERS FOR PUBLIC SUPPLY AND IRRIGTION. PART 3: CANADIAN, NORTH CANADIAN, AND DEEP FORK RIVER BASINS THROUGH 1979,
Geological Survey, Oklahoma City, OK. Water Resources Div.
J. D. Stoner.
Geological Survey Water-Resources Investigations 81-80, May 1981. 210 p, 6 Fig, 3 Tab, 16 Ref.

Descriptors: *Water supply, *Irrigation, *Surface water, *Data collections, *Water quality, Water analysis, Trace elements, Hardness, Water use, *Oklahoma, Canadian River basin, North Canadian River basin, Deep Fork River basin.

Water-quality data through 1979 in the Canadian, North Canadian, and Deep Fork River basins within Oklahoma were examined for water type and suitability for public water supply and irrigation use. Of 105 stations with available data, 47 stations or 45% were considered to have sufficient

data for analysis. The classification fo water type was based on the relation of the major ions: calcium, magnesium, sodium, carbonate, bicarbonate, sulfate, and chloride to each other within the range of measured specific conductance. The suitability for use as a public supply was based on the concentration distribution of selected constituents. The constituents selected were those with maximum contaminant levels established by regulation, or constituents for which recommended maximum limits have been established and for which historic data are available. The irrigation classification method of Wilcox was used to relate sodium, calcium, and magnesium concentrations and the salinity distribution to the use of the water for irrigation. Where data were available, the chance of phytotoxic effects by boron was discussed. (USGS)
W83-03362

8. ENGINEERING WORKS

8A. Structures

SOIL COLLAPSES ON SHORES OF CLEAR LAKE RESERVOIR, MODOC COUNTY, CALIFORNIA,
Water and Power Resources Service, Sacramento, CA. Mid-Pacific Region.
N. P. Prokopovich.
Bulletin of the Association of Engineering Geologists, Vol 19, No 4, p 327-332, November, 1982. 5 Fig, 8 Ref.

Descriptors: *Reservoirs, *Collapse, Construction, *California, Clear Lake Reservoir, Maintenance, Soil Properties, Leaks, Infiltration.

Peculiar soil collapses on the western shore of Clear Lake Reservoir in Modoc County were investigated. This reservoir has high seepage water losses, amounting to about 20% of the average water inflow. Soil collapses are relatively common in 'leaky reservoirs'. Most can be attributed to one of three processes: first, the increase in weight of overburden capping preexisting cavities brought about during or shortly after initial flooding causes cave-ins; second, the piping of overburden into cavities by seeping reservoir water can cause collapses in submerged portions of the reservoir. The third process, probably invalid in the present case, is collapse caused by subsidence due to an increase in the actual weight of the overburden above an open lava tube or fissure, due to losses of buoyance during the lowering of the reservoir levels. Major cavities noted in Clear Lake Reservoir in 1959 and 1977 were repaired to prevent water losses. (Baker-FRC)
W83-03189

FLUSHING OF RESERVOIRS AS A MEANS OF INCREASING THE OPERATING EFFICIENCY OF HYDROELECTRIC STATIONS,
A. S. Vorob'ev.
Hydrotechnical Construction, Vol 15, No 9, p 517-521, 1981. 1 Fig, 2 Tab, 4 Ref. Translated from Gidrotekhnicheskoe Stroitel'stvo, No 9, p 14-16, September, 1981.

Descriptors: *Flushing, *Reservoir silting, *Sediment control, Reservoir capacity, Reservoir operation, Hydroelectric plants, Operating policies, Electric power production, Silting, *USSR, Chir-Yurt Reservoir, Sulak River.

The advantages of flushing reservoirs to increase storage capacity and reduce damages from excess sediments are demonstrated by several examples. The Chir-Yurt reservoir on the Sulak River, USSR, was flushed in 1968, resulting in removal of 8 million cu m of sediment in 4 days. This 100 million cu m reservoir had become 90% silted within 5 years of its initial operation. Normal operating conditions were maintained for several years afterwards. The Golovnaya hydrostation reservoir on the Vakhsh River was not shut down during a flushing operation, which removed 2.2 million cu m of sediment within 6 days with a 4.5 m lowering of the water level. For the year 1979 increases in electric power production at Chir-Yurt hydrostation after flushing were 32.5 million kWh from decreasing idle discharges and 4.1 million kWh from increasing the average head. (Cassar-FRC)
W83-03198

THE MEGGET SCHEME.
Water Services, Vol 86, No 1038, p 371-372, August, 1982.

Descriptors: *Water supply, *Water resources development, *Construction, Dams, Pipes, Pipelines, Megget Scheme, *Scotland, Spillways.

The Megget scheme will serve to augment the Lothian Region's water supply and increase the amount of water available to Edinburgh by about 60%. The dam is 56 m high, with a crest length of 568 m and a capacity of 61,400 M liters. The drawoff and overflow works compromise two eccentric concrete towers. The top of the outer tower forms the spillway, and water passes down the annular space between the towers to culverts below. The first stage of the scheme is projected to meet water demand in the region for many years. The second stage will include pumping water from St. Mary's Lock into the Megget reservoir and laying a duplicate pipeline parallel to the existing one. This will meet supply requirements well into the next century. (Baker-FRC)
W83-03248

BUILDING BRAZIL'S NOVA AVANHANDAVA DAM,
Companhia Energetica de Sao Paulo (Brazil).
C. R. de Moraes Leme.
International Water Power and Dam Construction, Vol 34, No 11, p 47-51, 1982. 7 Fig.

Descriptors: *Dams, *Construction, Design criteria, Banks, Earth dams, Soil characteristics, *Brazil, Nova Avandandava Dam.

The completion of the Nova Avanhandava dam in Brazil and the associated works marks a further stage in the construction of a 1000 km navigable waterway linking the Tiete and Parana rivers at Itaipu and Barra Bonita, respectively. It has also added 300 MW of capacity to the country's electrical system. Its construction procedures are described in this article. The hydroelectric plant comprises the intake, powerhouse, erection bay and draft tube, three Kaplan turbines in concrete spiral cases and three-phase synchronous generators for the generation units. Hydraulic model testing showed that a horizontal anti-vortex beam was needed. The crest elevation for the dam was determined at 361.50 m. The surface spillway is 85 m wide, with a crest elevation of 343 m. It was decided to construct homogeneous earth embankments in both abutments. Further studies showed the convenience and economic advantages of placing the rock from the navigation lock on the right abutment dam. For the left bank dam the saprolite material that occurs under the colluvial soil in the left borrow area on a part of the upstream slope was used. (Baker-FRC)
W83-03253

MANAGING FOR WAVES ON NEBRASKA'S LAKE MCCONAUGHY - AN OVERVIEW,
Nebraska Water Resources Center, Lincoln.
M. L. Quinn.
Canadian Water Resources Journal, Vol 7, No 2, p 63-89, 1982. 12 Fig, 3 Tab, 20 Ref.

Descriptors: *Waves, *Reservoirs, *Storms, Lake McConaughy, Dams, Lakes, Wind, Water management, Construction, Riprap, Kingsley Dam, Fetch, *Nebraska.

Field investigation for Kingsley Dam on the North Platte River in Western Nebraska began in 1936, and dam construction began in 1938. Reservoir storage began in February 1941, and a peak elevation of 968.3 m was reached in June 1941. The resulting Lake McConaughy was one of the first large reservoirs to be built on the Great Plains and serves both irrigation and hydroelectric purposes. Wind/wave problems had previously been encounted on the Great Plains, but the magnitude of problems produced at this location by the long stretch of open water coinciding with the direction of seasonally strong winds was not anticipated. Apparently primarily for the sake of cost considerations, articulated precast concrete block was selected for slope protection. Repeated incidents of wave damage required reconstruction of the slope protection layer in 1942-46 and costly repairs at intervals thereafter. In 1959-63 concrete hexapods, usually used for seacoast protection, were attached to the wave wall using heavy cables. In May 1972 a protracted, severe windstorm, with waves up to 3 m in height seriously damaged the slope protection. Washout areas were repaired with a sand/gravel/stone filter structure. Reservoir operating policy was modified to permit a maximum water elevation of 994 m during the storm-prone season and 995.4 m for the rest of the year. Subsequent damage has been minimal, but research on the unusual wind-wave phenomena at Lake McConaughy is continuing. (Baker-FRC)
W83-03426

POSSIBILITY OF REDUCING ENERGY COSTS FOR WATER CONVEYANCE USING A PRELIMINARY RESERVOIR (EINSPARMOGLICHKEIT AN ENERGIEKOSTEN ZUR WASSERFORDERUNG DURCH EINSATZ EINES VORBEHALTERS),
S. Mattyus.
Gas- und Wasserfach: Wasser/Abwasser, Vol 122, No 5, p 201-205, May, 1981. 5 Fig. English abstract.

Descriptors: *Pumped storage, *Reservoirs, *Reservoir design, *Water pressure, Storage, Pumping, Reservoir operation, Storage reservoirs, Multireservoir networks, Water distribution, Water conveyance, Federal Republic of Germany.

A pumped storage reservoir with a small surface but large depth can be placed in front of a main reservoir at the same, greater, or lesser elevation. The water level in the pumped storage reservoir can be regulated to match water demand through the use of pumps and valves. When the pumped storage reservoir is at the same or a lower elevation, energy costs are reduced. When the pumped storage reservoir is at a higher elevation, water in the main reservoir is still available during peak demand periods. The capacity of the main reservoir is thus fully utilized, and the distribution network is protected from unnecessarily high pressures. (Author's Abstract)
W83-03459

8B. Hydraulics

FLUID MECHANICS - THE GREEN FUNCTION OF THE NEUMANN-KELVIN PROBLEM IN A CANAL,
Nantes Univ. (France).
C. Do.
Comptes Rendus Hebdomadaires des Seances de l'Academie des Sciences, Vol 294, No 17, p 1053-1056, May, 1982. 6 Ref. English summary.

Descriptors: *Flow, *Canal design, *Velocity potential, *Fluid flow, *Hydraulics, Canals, Fluid, Gravity flow, Mathematical studies, Fourier analysis, Mathematical analysis, Mathematical equations, Surface velocity, Surface flow.

A source of constant strength moves with a uniform motion inside a horizontal rectangular cylindrical canal, filled with an incompressible fluid limited by a free surface in the gravity field. The resulting flow is presumed to be steady past a mark linked relatively to the source. The velocity potential of the flow generated by this source is the Green function of the Neumann-Kelvin problem. A constructive Fourier method leads to an existence, uniqueness, and representation theorem for this Green function. Downstream from the source, the velocity potential is the sum of a term defining a uniform flow, a term corresponding to a surge engendered by the source and reflected from the walls, and the third term which decreases rapidly with increasing distance. (Titus-FRC)
W83-03188

THE CONSTRUCTION AND OPERATION OF AN ARTICULATED LABORATORY FLOW CHANNEL,
Bolton Inst. of Tech. (England). Dept. of Civil Engineering.
W. R. Lomax.
Water Services, Vol 86, No 1038, p 387-388, August, 1982. 3 Fig, 1 Tab, 2 Ref.

Descriptors: *Channels, *Flow characteristics, *Flow profiles, Flow channels, Flow measurement, Flow pattern, Hydraulics, Computers.

The design and construction of a hinged flow channel for use in a hydraulics teaching laboratory are described. Details are outlined of a method for generating theoretical surface profiles by means of an interactive computer program. While most laboratory flows are suitable for the investigation of rapidly varying flow situations, the situation is somewhat limited if the requirement is to generate and measure a composite, gradually varied, non-uniform flow profile. This problem is overcome by constructing a long channel with a number of hinges, which enable a series of channel lengths or reaches to be set up with different bed slopes. The arrangement for the supply of water to the channel makes use of an existing constant head supply tank at high level and a storage tank below floor level. A number of well known control structures can be inserted into the channel in order to generate a particular profile combination. (Baker-FRC)
W83-03230

HYDRAULIC CRITERIA FOR THE DESIGN OF WEIR SILLS (HYDRAULISCHE ENTWURFS- UND BEMESSUNGSKRITERIEN FUR SOHLSCHWELLEN),
Stuttgart Univ. (Germany, F.R.).
P. Muller, and H. Kobus.
Wasserwirtschaft, Vol 71, No 1, p 295-298, October, 1981. 8 Fig, 6 Ref. English abstract.

Descriptors: *Measuring instruments, *Weirs, *Gages, *Discharge measurements, Flow, Rivers, Gaging stations, Stream gages, Fisheries, Recreation, Water sports, Stream discharge, Flow discharge.

By installation of weir sills as discharge measurement structures at water gauges, it is possible to improve the determination of low discharges in streams. A method of determining the appropriate dimensions for weir sills in rivers is presented. The method is the result of a two year research effort; it applies to rivers ranging from 5 to 30 meters in width and with peak flows up to 100 cubic meters per second. The positioning and angle of the weir is critical, since improper location will alter the stream banks. Canoeing and fish ladders impose constraints on the height of a weir. Design is based on an analysis of both stream flow patterns and stream configuration. (Titus-FRC)
W83-03241

MODELLING THE FLOOD ALLEVIATION SCHEME FOR THE USK AT BRECON,
T. E. Evans, E. Chang, and B. Brighouse.
Water Services, Vol 86, No 1038, p 397-399, August, 1982. 5 Fig, 1 Tab, 4 Ref.

Descriptors: *Flood control, *Construction, *Model studies, Channel flow, Floods, Predicting, Estimating, Bridges, Usk River, *Wales, Flood protection, Hydrologic models, Mathematical models, Scour, Hydraulics.

A feasibility study was prepared for the Welsh Water Authority to evaluate the size and frequency of occurrence of floods in Brecon and assess the economics of alternative measures to reduce the flood risk. Detailed designs were then prepared, and construction of the works proposed is to be carried out between September 1981 and September 1982. Because of the irregular flow distribution through the bridge and due to the lack of recorded data to calibrate the mathematical hydrological model for a range of flood levels, the head loss through the bridge could not be predicted by using an analytical solution alone. Subsequently, model tests of the Llanfaes bridge, Brecon, showed that with a 1 in 100 year flood, supercritical flow will occur through the bridge. In view of this, the lowering of the bridge invert and the raisig of the proposed embankments and walls below the Llanfaes bridge were recommended as an alternative to the extensive downstream channel improvements previously proposed. (Baker-FRC)
W83-03247

HYDRAULIC ANALYSIS OF SURCHARGED STORM SEWER SYSTEMS,
Kentucky Water Resources Research Inst., Lexington.
D. J. Wood, and G. C. Heitzman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-224238, Price codes: A08 in paper copy, A01 in microfiche. Research Report No 137, March 1983. 152 p, 43 Fig, 11 Tab, 54 Ref. OWRT A-084-KY(1), 14-34-0001-1119, 14-34-0001-2119.

Descriptors: *Storm sewers, Flow, Transition flow, *Unsteady flow, *Sewer systems, Sewers, Model studies, *Finite element analysis, Computer programs, *Hydraulics, Hydraulic grade.

The primary objective of this report was to carry out a investigation which would be a basis for the development of a hydraulic flow model for the analysis of storm sewer systems at peak flows. The unsteady distributed parameter finite element model provided the most accurate and reliable solution of the system continuity and momentum equations. It is recommended that a finite element model woould provide a useful tool for the analysis of transients in closed conduits. The dynamic lumped parameter model provides a simple reliable method for the analysis of storm sewer systems under surcharge. The kinematic model is a time modified steady flow model which predicts total head flow values from previously known steady state conditions. These flow models are applied to several example storm sewer systems under surcharge conditions. Plots of hydraulic grade and flow throughout the sewer systems under surcharge conditions are presented to evaluate the ability of each model to accurately analyze storm sewer systems under surcharge. Computer programs are developed for each model.
W83-03374

INLET CONSTRUCTION FOR VORTEX DROPS WITH SUPERCRITICAL INFLOW (EINLAUFKONSTRUKTION FUR WIRBELFALLSCHACHTE MIT SCHIESSENDEM ZUFLUSS),
Technische Univ., Munich (Germany, F.R.). Inst. fuer Hydraulik und Gewasserkunke.
A. Kleinschroth, and G. Koplitz-Weissgerber.
Gas- und Wasserfach: Wasser/Abwasser, Vol 122, No 5, p 212-215, May, 1981. 5 Fig, 7 Ref.

Descriptors: *Vortices, *Hydraulic engineering, *Rapid flow, *Design criteria, *Construction methods, Flow characteristics, Hydraulics, Hydrodynamics, Flow, Model studies, Overfalls, Vortex drops, Prediction, Mathematical studies, Mathematical equations, Wastewater facilities, Flood control.

A construction design and calculation procedures were developed in an attempt to eliminate the need for hydraulic model experiments in the design of vortex drop inlets with supercritical inflow. Simplicity of form and space saving were important factors influencing construction design, which consists of a complex curve in which the ratio of inflow-channel width and shaft diameter can be selected such that the width/diameter ratio equals approximately 1/2. The base, tranverse to the direction of flow, is horizontal. The incline, which is in the same direction as the flow, depends on the available height for construction, and its angle should be between 10 and 20%. Equations are given to calculate outflow, the relationship between vertical and tangential speed components at the inlet, the vertical component of outflow speed, the vertical components of speeds in various sections of the shaft, maximal flow depth in the vortex chamber, and maximal outflow, whereby such assumptions as the existence of a constant energy level in the inlet area and a linear pressure distribution in the annular jet at the inlet as well as equal total speeds at the narrowest point of the vortex and at the start of the shaft are in effect. To test these theorectical results, a model was constructed with an inflow-channel width of 70 mm, a shaft diameter of 140 mm, and inclines of between 2 and 20% for the inflow channel and 5 and 20% for the vortex chamber. The predicted maximal outflow of 30 l/sec could not be matched in practice (above 25 l/sec outflow became turbulent and sometimes overflowed from the vortex chamber). Maximal water depths achieved in the water chamber agreed well with the predicted level. Agreement between theory and experiment was good enough that the calculated results would be useful in practice. (Gish-FRC)
W83-03481

8C. Hydraulic Machinery

SLIDE VALVES SAVE COSTS.
Water Services, Vol 86, No 1032, p 66, February, 1982. 1 Fig.

Descriptors: *Hydraulic equipment, *Penstocks, *Hydraulic valves, Water conveyance, *United Kingdom.

Wey slide valves and penstocks, manufactured and marketed in the United Kingdom by The Reiss Engineering Company Limited, have been instrumental in achieving substantial savings in sewage treatment plants. Both the slide valves and the penstocks utilize a knife-edge door and nitrile resilient rubber seals both around the periphery of the door and in the transverse position on each face of the door. The slide valve combines modern technology in sealing techniques with the advantages of simple construction, few basic components, and quick-action, and 'free-flow' design in order to deliver virtually full-bore flow characteristics with minimal pressure drop and positive sealing. Special flush-out corners in the slide valves andd penstocks force any accumulated deposits into the flow during the closing movement. Both the slide valves and the penstocks are designed for simple routine maintenance and long and trouble-free operating lives. (Carroll-FRC)
W83-03232

VALVES, PENSTOCKS AND ACTUATORS: RELIABLE CONTROL OF WATER SYSTEMS,
For primary bibliographic entry see Field 5F.
W83-03245

KEEPING THE FLOW SMOOTH.
Water Services, Vol 86, No 1032, p 69, February, 1982.

Descriptors: *Hydraulic equipment, *Air valves, *Valves, Pipeline, Flow, Hydraulics, Water hammer, Corrosion, United Kingdom.

Air in pipelines can cause a variety of problems, including delays in filling, reduction in capacity, water hammer, and corrosion. Although air valves invariably supply the solution to these problems, finding the right valve for the right situation is sometimes difficult. British valve manufacturers Glenfield and Kennedy produce three basic types of air valves, each designed for specific applications. A small orifice valve is designed to release air which has come out of solution in the system during pressurized operation. Air collecting in the valve body depresses the water level until buoyancy is lost and the float falls away from the outlet orifice, releasing the air. These valves are suitable for situations in which air becomes trapped due to the upward gradient decreasing or the downward gradient increasing. A large orifice valve is designed to allow amounts of air to exhaust from the pipeline during the initial filling and to permit free entry of air during emptying. A cylindrical or spherical float in this valve remains open during filling or emptying, closing only when water rises into the valve body. Two forms of a double orifice valve are also available. The first has a large orifice unit forming the main assembly, with an attached

small orifice unit and no integral isolation valve, while the second comproses a valve built around a central screwdown isolating valve which has the small and large units disposed around it. These valves are suitable for use in horizontal sections or in pipelines with only very slight gradients. (Carroll-FRC)
W83-03249

CENTRIFUGAL PUMP BASICS,
Allis-Chalmers Corp., Cincinnati, OH. Industrial Pump Div.
W. W. French.
Water/Engineering and Management, Vol 129, No 13, p 33-35, December, 1982. 5 Fig.

Descriptors: *Pumps, *Mechanical equipment, Engineering, Centrifugal pumps, Pumping.

A description of the workings of the centrifugal pump is offered. Such a pump uses centrifugal force to move a liquid from one point to another by creating pressure. This force may be used to pump any liquid that will flow. With reference to operating principle, centrifugal pumps fall into three general classes: radial flow, mixed flow and axial flow. The main parts of the pump include the impeller, wear rings, shaft bearings, casing and the stuffing box. For optimum shaft life, and the following conditions should be considered at the time the pump is selected: corrosive nature of the fluid being pumped, operating range with respect to the best efficiency point, and the alignment of the pump and driver. A listing of nomenclature for centrifugal pumps is included. (Baker-FRC)
W83-03258

WIND ENERGY FOR LOW HEAD IRRIGATION,
South Dakota State Univ., Brookings. Water Resources Research Inst.
J. L. Wiersma, and A. R. Bender.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-220558, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, April 1983. 36 p, 10 Fig, 6 Tab. OWRT B-062-SDAK(1), 14-34-0001-0278.

Descriptors: *Pumps, Trees, *Irrigation, Winds, Energy, *Shelterbelts, Specialty crops, Low head irrigation, Air compressors, Wind turbines.

An air compressor driven by a wind turbine can be used to operate an air lift water pump. In locations where a shallow aquifer yields a limited quantity of water per unit of time, it is a successful economical method of pumping water for the irrigation of a crop that does not have a critical period of water demand. The amount of submergence of the pumping unit is critical. The efficiency of the system increases as the submergence increases. The efficiency is also dependent upon the proper sizing of the eductor tube. The factors determining the size include submergence, pressure of compressed air, quantity of compressed air available, amount of water lift, and quantity of water required. The rate of air introduced to the eductor tube must be controlled for efficient operation.
W83-03309

ENERGY RECLAMATION FROM THE DRINKING WATER SYSTEM WITH SERIES-CONNECTED PUMPS (ENERGIERUCKGEWINNUNG AUS DEM TRINKWASSERSYSTEM MIT SERIENPUMPEN),
Stuttgart Univ. (Germany, F.R.).
K. Mikus.
Gas- und Wasserfach: Wasser/Abwasser, Vol 122, No 2, p 52-57, February, 1981. 5 Fig, 3 Ref. English abstract.

Descriptors: *Energy sources, *Water conveyance, *Turbines, *Pumps, *Water pressure, Water distribution, Drinking water, Stuttgart, Federal Republic of Germany, Economic aspects, Hydraulic turbines, Excess pressure, Performance evaluation.

The water distribution system of the city of Stuttgart (Federal Republic of Germany) covers an area with elevation differences of 300 m and contains 56 pressure zones, requiring the release of excess pressures of 12-15 bar. Conventional methods of pressure relief (using valves) result in an irreversible transformation of pressure energy to waste heat. Traditional water turbine facilities are economical only when large quantities of hydraulic power are used. At Stuttgart, series-connected pumps are being used as turbines to reclaim energy. This system requires only a small capital outlay and small quantities of hydraulic power. A pump can be transformed into a turbine by reversing both the direction of rotation and the poles on the electric motor. A pump used as a turbine is usually at least as efficient, sometimes even more effective as when it runs as a pump, especially in overload, when efficiency declines less steeply for the turbine mode of operation. The pump as turbine can handle a significantly greater drop height as well as a larger throughput volume than it can as a pump. When planning such a system, points to be considered include the necessity of converting pump data to turbine data, the fact that the system can also run with back pressure on the suction side, and the necessity of providing a device to divert the water in the case of breakdown or overload. (Gish-FRC)
W83-03460

8D. Soil Mechanics

DETERMINATION OF THE PARAMETERS OF LARGE UNLINED CANALS ON THE BASIS OF HYDROLOGICOMORPHOLOGICAL ANALOGY,
V. I. Antropovskii.
Hydrotechnical Construction, Vol 15, No 10, p 618-622, 1981/1982, 3 Fig, 3 Tab, 9 Ref. Translated from Gidrotekhnicheskoe Stroitel'stvo, No 10, p 37-40, October, 1981.

Descriptors: *Canal design, *Channel morphology, *Soil stability, Design criteria, Channel erosion, Erosion control, Open channels, Stable channels, Cohesionless soils, Soil mechanics, *USSR, Irtysh River.

The optimal parameters of large unlined canals may be determined by an analogy between the hydrological and morphological characteristics of natural rivers and canals. A graph relates the canal slope to the water discharge and characteristics of the underlying soils. Equations are given for three groups of soils: pebbles, gravels and coarse sands; finer sands and loams; and loamy sands, silt, and loess. The average flow velocity in the cross section of the planned canal may also be obtained from the graph, knowing discharge and canal slope. The size and shape of canal cross sections may also be determined by analogy to river stretches with considerable streamflow regulation. This is illustrated in a design channel based on a stretch of the Irtysh River from Lake Zaisan to Malaya Krasnoyarska village, USSR. Dimensions of the cross section obtained by this method were similar to those obtained by hydraulic methods. (Cassar-FRC)
W83-03197

EVALUATING THE RELIABILITY OF EARTH DAMS ACCORDING TO THE SECOND GROUP OF LIMIT STATES (METHOD OF PREDICTING DAM BEHAVIOR),
G. Ya. Bulatov.
Hydrotechnical Construction, Vol 15, No 10, p 598-603, 1981/1982. 2 Fig, 14 Ref. Translated from Gidroteknicheskoe Stroitel'stvo, No 10, p 26-28, October, 1981.

Descriptors: *Dam stability, *Seepage, *Cracks, Dam failure, Earth dams, Flow resistance, USSR.

A method for predicting the stability of earth dams is based on summation of resistances along the path of a concentrated seepage flow (fictitious pipe). When cracks occur in the core in which flow velocity exceeds the level of non-eroding velocities, the core material is reworked, and the crack cavity fills with coarse material (upstream andd adjacent to the core) under certain conditions . This is illustrated in the example of the 20 m high Boulderhead Dam. Calculations indicated failure from a crack in the core, which was confirmed by an inspection. Very large, uneven settlements in a 75 m high dam were predicted to be self-healing, with formation of a plug at the contact with the filter. This behavior has been confirmed by observation. The dam is functioning normally. (Cassar-FRC)
W83-03218

8G. Materials

PLASTIC TANKS: PITFALLS TO AVOID,
Forbes (Kenneth) (Plastics) Ltd., Downham Market (England).
L. Forbes.
Water and Waste Treatment, Vol 25, No 8, p 18-19, August, 1982. 2 Fig.

Descriptors: *Construction, *Tanks, *Wastewater treatment, *Water storage, Storage, Plastic, Construction materials, Design criteria, Cost analysis.

There are many advantages to using plastic tanks in the water industry providing one is very careful in selecting a reputable fabricator who has long term experience on design, manufacture and application. In most cases there is no more cost effective alternative to the all plastic tank. It is paramount that careful design parameters be maintained, especially in view of the time-related 'creep' properties of plastics under load. The vertical cylindrical configuration proves to be far the most economical approach to design. Always insist that the tank be fully designed and, where applicable, conform in every aspect to British Standard 4994-1973. All design calculations must be available at the time fo ordering. One should insist on either seeing a similar tank which has been in a similar duty for a period of years or alternatively speaking to an end user with similar long term experience. Beware of short specification and exceptionally low cost compared to other quotations. Ensure that the supplier can construct tanks in a variety of plastic materials. The quality control system should be considered, and work must be carried out by fully tested and certified fabricators. A long term guarantee of the product against defective workmanship, design or materials must be supplied. Dangerous reagent chemicals must be stored in tanks which are to the specifications laid down by the major chemical suppliers. (Baker-FRC)
W83-03250

8I. Fisheries Engineering

EFFICIENT UTILIZATION OF INDUSTRIAL WASTER AND WASTE HEAT FOR INTENSIVE FISH PRODUCTION (DIE RATIONELLE NUTZUNG VON INDUSTRIEWASSER UND ABWARME FUR EINE INTENSIVE FISCHPRODUKTION),
VEB Binnenfischerei, Wermsdorf (German D.R.).
For primary bibliographic entry see Field 3C.
W83-03221

AQUACULTURE TECHNIQUES: A PRODUCTION FORECASTING MODEL FOR AQUACULTURE SYSTEMS,
Idaho Univ., Moscow. Coll. of Forestry, Wildlife and Range Sciences.
P. C. Downey, and G. W. Klontz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB83-221713, Price codes: A05 in paper copy, A01 in microfiche. Idaho Water and Energy Resources Research Institute Completion Report, Moscow, March 1983. 78 p, 7 Fig, 4 Tab, 112 Ref, 1 Append. OWRT A-063-IDA(2), 14-34-0001-0216.

Descriptors: Instream flows, Salmonids, Rainbow trout, Oxygen concentrations, *Aqua culture, *Model studies, *Fish production forecasting.

Computer implementation of the mathematical models of quantitative relationships in aquaculture systems is a dynamic process which provides a

conceptual framework for understanding systems behavior. These models can provide useful information on variable significance to systems functioning, thereby directing research resources into areas which will most benefit further understanding of the system. Furthermore, as aquaculture systems research progresses, the composite model can be modified to incorporate new technology. Modeling, therefore, is a cyclic process–a means for understanding the system, for evaluating the system, and for using the model to incorporate the new technology. This computer-implemented mathematical model addresses one of the significant limitations of aquaculture systems management, namely, production forecasting, by providing a method of using current technology to predict Allowable Growth Rate (AGR). The use of the model in aqua-culture operations could aid production forecasting, resulting in more efficient water usage and profitable aquaculture systems operations.
W83-03318

9. MANPOWER, GRANTS AND FACILITIES

9C. Research Facilities

A CENTER FOR THE TRANSFER OF DESALINATION TECHNOLOGY,
Fairleigh Dickinson Univ., Teaneck, NJ. Coll. of Science and Engineering.
For primary bibliographic entry see Field 3A.
W83-03352

10. SCIENTIFIC AND TECHNICAL INFORMATION

10F. Preparation Of Reviews

AGRICULTURAL IRRIGATION TECHNOLOGY TRANSFER ASSESSMENT,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 3F.
W83-03281

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

W83-03487

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSSION NUMBER INDEX

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